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ABSTRACT

Chapter 1 of this study discusses sources of educational inequality in terms of criteria for resource allocation, definitions of educational equity, and equity and efficiency in the classroom. Following the second chapter's review of literature on how resources affect learning, chapter 3 offers a theory of resource allocation education. The fourth chapter's attention to students' decision-making and their home and classroom time allocation is followed in chapter 5 by a look at parents' investments of time and money in their children's educations, and at their influence on schools. Chapters 6 and 7, respectively, address questions of diversity and uniformity in classrooms and resource allocation and the curriculum. Finally, chapter 8 discusses the goals and content of education, as well as interactive relationships and incentives in public education. The first of three appendixes describes the study's research design, its population, and sampling procedures. Conducted over a 3-year period, the study involved 20 randomly selected school districts in the Chicago area, including 23 schools, 62 classrooms, and 253 public school fifth grade students. Appendix B provides a sample of a complete parent interview; appendix C briefly examines resource allocations within classrooms. The report contains approximately 50 tables. (JBM)

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FINAL REPORT

MONEY, TIME AND LEARNING

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Chapter 1

SOURCES OF INEQUALITY IN EDUCATION

> "Planners, no matter how much discretionary power they have, never determine the actual outcome of policy. They can only set in action forces which they anticipate, with or without rational justification, will have certain effects. The effects themselves are the result of the millions of micro-decisions made by individuals who are responding to the planners' policies in terms of (a) the actual pattern of rewards (positive or negative) which their decision matrix presents and (b) their perception of this pattern." (Windham, 1978, p. 4)

Decisions to provide money and time for children's education are made by two kinds of individuals. They include, first, the educational planners, legislators, and administrators whose behavior affects large numbers of students. The second type of decision maker includes individual students who supply their own time, and parents who provide both time and money for their children's education. Members of the first category base their choices on the social benefits anticipated from the provision of schooling to the general population,[1] while individual students and parents are motivated by their own perceptions of self interest.[2]

Each of these categories of individuals influences the decisions of members of the other group. Thus, the educational opportunities available in schools and colleges are incentives which encourage parents and students to increase their own investments. Also, the decisions of parents and students to supply time and money for the latter's education affects the amount and kinds of services supplied by formal educational systems. These interactions between individuals and organizations constitute a main theme of this Report.

(1) Introduction

Education is not synonymous with schooling, since children learn at home as well as in school. Furthermore, children as well as adults make choices which affect learning; to a degree, all people are self-educated.[3] Homes and schools are interacting agencies, since the learning which occurs in homes affects children's ability to profit from schooling, while schooling enhances children's home learning. The nature and distribution of educational outcomes are therefore affected by the decisions of parents, students, and school officials.

Planners, legislators, and administrators determine how money will be raised and distributed throughout state educational systems. Their decisions also affect how money is spent and how specific teachers and material resources are allotted to classrooms. Parents' decisions, as well, affect the classroom context of learning. Students' capabilities, which are affected by home investments made before and after children enroll in school, affect the behavior of teachers and students' peers. Teachers, of course, play the central role in classroom management, because they combine students' time with purchased resources. We will examine the resource allocation decisions of administrators, teachers, parents and students, all of whom are affected by widely shared values.

(2) Criteria for Resource Allocation

Philosophers, legal analysts, and students of education have identified three widely shared criteria for determining the desirability of public policies. These values -- equity, efficiency, and freedom of choice --

provide a normative framework for our research and enable us to compare and contrast the effects of decisions made by different categories of individuals at different levels of educational systems.[4]

(a) Because of the importance of education in facilitating or denying access of individuals to the economic and social privileges which people value, equity (or fairness) is widely regarded as a central objective of educational policy. We find that equity is defined in various ways, and that the specification of these definitions is an important ingredient of policy analysis. Legislators and administrators have only a limited effect on equity in education since whether educational systems are equitable depends on decisions of individual families and students, as well as those of educators.

(b) While the benefits derived from schooling are broadly valued, many public and private decision makers object to its cost. It is not, therefore, surprising that demands for improved efficiency (whether defined as reducing costs or improving outcomes) are heard in many quarters.[5]

(c) Since families differ in their preferences for the amount and kind of education their children should receive, freedom of choice has become embedded in the various levels of educational systems. Thus, many states have preserved the right of school districts to select the level of tax rates and expenditures which conforms to their communities' perceptions of the best level at which schools should be supported. Also, in some school systems there are so-called "alternative" schools permitting parents to choose the form of school organization and instructional procedure they prefer. Alternative tracks in classrooms may permit the matching of students' abilities and interests with their curricular choices. Finally,

parents' use of home resources exposes many children to a curriculum which differs from that offered by their schools.

Permitting communities and families to choose the amount and kind of education children should receive is, of course, likely to result in inequalities. For example, when school districts are permitted to set their own expenditure levels, inter-district inequalities, associated with the wealth of school districts and the aspiration levels of their inhabitants, are likely to result. Similarly, permitting parents to select the schools their children will attend, whether by voucher systems or alternative schools, may result in unequal opportunities, often associated with parents' incomes and access to information. Even tracking in high schools may result in unequal access to resources and in unequal attainment.[6] Despite the ubiquity of value conflict in decision making, the search for equity, efficiency, and freedom of choice is likely to continue. Policy makers do not select one or another of these values, but choose from many possible trade-offs among them.

In the remainder of the Chapter, we first examine the various meanings which have been assigned to the concept of educational equity. We also discuss the concepts of efficiency and freedom of choice, and consider how the three concepts compete with one another for the attention of policy makers and the general public. As an example of the conflict between equity and efficiency, we examine some recent research into resource allocation processes in classrooms.

(3) Definitions of Equity in Education[7]

While policy analysts agree that "equalizing educational opportunity" is a desirable goal, they are often unclear about how that goal should be defined. In this section of Chapter 1 we examine several approaches to defining equity in education, and we also note that the concepts of equity and efficiency are often difficult to disentangle. We show that the concept of equalizing educational opportunity has various meanings, according to the level at which it is applied. Finally, we stress that efforts of educational planners to equalize opportunities may be frustrated by the manner in which families supply time and money to the education of their children.[8]

The concept of equity is differentiated, in the literature of taxation, into (a) horizontal equity, or the equal treatment of equals, and (b) vertical equity, or the fair treatment of individuals who are, in relevant respects, unequal. We apply this distinction to our discussion of how resources are provided (a) to students as a whole, and (b) to students who are unequal in their ability to benefit from educational services.

A. Horizontal equity. Many State Constitutions require that State Legislatures establish and maintain a "free and uniform" system of public schools. While the tern "uniform" is rather vague, it may be taken to imply that schools should have approximately equivalent resource inputs, that the outcomes of schooling should not vary excessively from community to community in the same state, and that the content of instruction should be essentially uniform among schools in a given state.[9]

(a) One purpose of school finance systems is to equalize (or, at least, to reduce the variance in) expenditure levels for education among

school districts within states.[10] Within school districts, school boards and administrators are responsible for distributing personnel and material resources among schools and classrooms so that, regardless of the school they attend and the classroom to which they are assigned, students will have access to similar resources. Within classrooms, teachers are expected to ensure that educational services are distributed fairly among their students. However, even when resource inputs are distributed equally within and among classrooms, wide disparities may remain in the time and money provided to students in their homes. Since resources provided to children at home are assumed to affect children's learning capabilities, differences in students' backgrounds may influence their ability to benefit from resources provided at school (Chapter 5).

(b) A second definition of horizontal equity is that the variance among students in their level of educational outcomes should be kept at a minimum. However, the power of educational systems to equalize students' achievement is limited; research suggests that, when out-of-school variables are controlled, the characteristics of schools have only a slight effect on achievement.[11] Homes, on the other hand, have both a direct and an indirect effect on learning, since families may (a) provide direct learning and (b) influence the characteristics of children's schools (Chapters 5, 7).

(c) A third aspect of horizontal equity is the attempt, by states, district officials, and, indirectly, the publishers of tests and textbooks, to standardize children's curricula.[12] Although the cumulative effect of these individuals and agencies may be substantial, they may be partly frustrated by differences in teachers' curricular priorities, and partly by children's home curricula which include (a) formal and informal instruction by parents and tutors and (b) private lessons purchased by parents for

children (Chapter 7). Finally, the manner in which schools and classrcoms are organized as well as the socio-psychological climate of schools may constitute a hidden curriculum which influences students' cognitive and affective learning outcomes in ways not measured by formal testing programs.[13] Differences in these so-called hidden curric[illegible]like home influences on learning, may cause inequalities even in sch[illegible]s which provide ostensibly equivalent services (See Chapters 6, 8).

B. Vertical equality, or the "equal treatment of unequals." Students' capabilities and interests vary, both among and within educational systems; school districts, schools and classrooms are organized so as to adapt, at least in part, to these variations. For example, school districts sometimes create special schools for the academically talented, the vocationally oriented, and the handicapped students; schools may create tracks for students of different ability levels; and grade school teachers may group students so as to adapt instructional treatments to differences in children's aptitudes.

(a) "Compensatory" programs are often implemented to provide special services to students who are handicapped because of their physical, mental, or economic characteristics. Categorical programs financed by the federal and state governments help support the education of children with various types of disadvantage. Programs designed to improve the learning ability of low achievement students have had limited success in narrowing the achievement gap among students, possibly because (a) the best technologies are not always utilized in these programs, and (b) inequalities which originate in the home cannot readily be remedied through programs provided in schools.[14]

In theory, however, compensatory education represents an attempt to reconcile the goals of equity and efficiency. If these programs succeed in improving students' ability to transform time into learning (and hence make them more productive learners), the system as a whole becomes more efficient, because more learning is produced for a given amount of purchased resources. At the same time, improving the learning abilities of previously low ability children leads to greater equity.[15]

(b) The obverse of compensatory education is the allocation of a more than average amount of resources to high ability students. This policy raises some agonizing problems of reconciling efficiency and equity.

Highly able students are, by definition, more able than their peers to transform time into learning; hence, after mastering a given unit of instruction, the more able students possess surplus time. This time is sometimes wasted, resulting in a serious loss in efficiency.[16] However, if the surplus time of able students is used to permit them to reach higher standards of performance than reached by the average student or to pursue a more difficult or more advanced topic or curricular area, the variance in students' performance may be increased, thus reducing equity. If the topics and subjects which advanced students study are not measured by standardized achievement tests, the increased variance in performance may not be apparent; this does not eliminate the problem that making good use of the time of the bright students may produce inequities in the content and amount of learning among students in a classroom.

There are many examples, at various levels of educational systems, of policies which result in disproportionately more resources being available for the more able than the less able students. For example, many countries base admission to higher levels of education on students' test

scores. As a result, while a basic education is provided to all students, the more advanced levels of education are reserved to students with above average ability. In these countries, then, total financial support is greater for high ability students than for the rest of the student body. In the United States similar patterns have been shown to exist in Florida and California. Researchers found that admission to universities with relatively high admission standards was reserved for able students who have, on the average, parents with above average income levels. The result of this system is that parents of low and middle income tended to subsidize, through the tax system, the education of children whose parents were relatively well to do.[17] It may, of course, be argued that educational systems which are stratified according to students' ability levels serve the important public purpose of identifying and training talented individuals for leadership posts in government and industry. However, the relatively high correlation between students' ability and parents' SES[18] suggests that parental status, rather than hard work and "native talent" may provide the basis on which students are screened for admission to higher levels of schooling. Our work and related studies indicate that parental resource allocation (even in the case of very young children) is related to their social class; parents' SES affects both learning at home and children's school learning, so that attempting to disentangle the effect of parental SES from that of students' measured "ability" is a difficult if not impossible task.

(4) Equity and Efficiency in the Classroom

In recent articles, Brown and Saks postulated that some teachers and district administrators, whom they called "elitist", concentrate resources

on their most able students while others, whom they dubbed "egalitarians", lavish resources on the least able students.[19] Since the "elitist" teachers attempt to maximize average test scores by concentrating resources on the most productive students, while the "egalitarians" concentrate on the slower students in order to minimize the variance in test scores, this is a classroom application of the familiar "equity-efficiency quandary."[20]

While the Brown-Saks approach is an important contribution, which emphasizes that, at the district and school/classroom levels, the goal of reducing the variance in student outcomes may be a legitimate alternative to maximizing average performance, it represents an over-simplified interpretation of teachers' classroom behavior. Faced with the necessity of providing instruction to students who differ in academic ability, teachers often differentiate their instructional procedures by providing simultaneous instruction to two or more groups of students, meanwhile adapting instructional treatments to the abilities and interests of students.

The efficacy of these treatments is not necessarily a function of the cost of teaching these groups. For example, a teacher may assign a library research project to a group of good readers (who have the ability to obtain information from the printed page), while providing personal attention to a group of poor readers. While the second group is being provided with more expensive resources than members of the first group, this is not necessarily an egalitarian strategy. Similarly, during the principal author's early experience as teacher in a one-room school, he (along with other teachers with similar responsibilities) arranged for the more advanced students in upper elementary grades to enroll in high school correspondence courses. Since the cost of these courses was spread over relatively large numbers of students, their per pupil cost was relatively

low, although the courses were constructed and the papers graded by well qualified and well paid professionals. These courses therefore provided high quality but inexpensive instruction for advanced students, while their less able peers were receiving more expensive instruction in the fundamentals of arithmetic, reading, and writing.

To take another example, students who complete their assignment in arithmetic are sometimes permitted by their teachers to do more advanced work in the same subject, or to complete assignments in other subjects. This is an example of the widespread practice of differentiating instruction along curricular rather than pedagogical lines. While the cost per pupil of providing "enriched" instruction (for example, by permitting students who complete their arithmetic assignment to do work in algebra or computer programming) may be relatively low, it may result in an efficient use of the time of the more able students. Since the teacher may provide intensive instruction in arithmetic to slower students, while the faster students are receiving enriched instruction in algebra, the adaptation is, in some respects, both efficient and equitable; on the other hand, utilizing procedures whereby all students are engaged in the same task during the same time period may be inefficient (since the time of the most and least able students is often wasted) and inequitable (because the middle ability student, to whom instruction is often addressed, is favored to the disadvantage of the slower and faster students).[21]

(5) Summary

The foregoing discussion of equity, efficiency, and freedom of choice in education constitutes a normative framework of our research into the antecedents and consequences of the resource allocation decisions of parents,

students, teachers, and administrators. While the above values are assumed to influence decisions made in educational organizations, their implications for decision making vary according to the level of the organization and the category of decision maker which is being examined.

Thus, we can reasonably assume that high level education officials including state officials, school superintendents, school board members, and principals are motivated, in part, by a desire to ensure that educational services are fairly distributed among students. Individual parents and students, on the other hand, are assumed to behave in accordance with their own perceived self-interest. Thus, while planners and administrators attempt to provide equal opportunities for all children, parents' allocation of time and money is influenced by their aspirations for their own children.

Similarly, whether schools are efficient depends, in part, on whether individual students are well motivated. In communities which place a high value on education, and where children are motivated to learn, schools may appear to be efficient, regardless of the level at which they are financed. In other communities where children are poorly motivated, schools may appear inefficient, even if well financed.

Since families' preferences for the content and means of instruction are assumed to vary, providing parents with a choice of curricula, modes of school organization, and instructional procedures may improve the motivation of parents (and their children as well) and hence cause them to increase their supply of time and money. Hence, freedom of choice in educational systems may result in improved efficiency as well as enhanced variety of offerings (See Chapter 7).

In summary, understanding how schools work requires an understanding of decisions made at various organizational levels and by various categories

of decision makers. We have therefore organized our analysis around the following topics.

We begin, in Chapter 2, with a summary of the research which deals with topics related to our own work. Chapter 2 therefore includes a discussion of studies dealing with the effects on learning of resources provided in schools and homes. It also summarizes studies of how children use time, at home and at school. Previous studies of the technology of classrooms are also discussed.

Chapter 3, which may be omitted without losing the main theme of the Report, brings together in one "model" the theoretical underpinnings of our investigation of resource allocation in homes and classrooms. The model regards time as a resource analogous to purchased resources provided by children, parents, and teachers. The Chapter emphasizes our main thrust which is not to explain the relationships between "inputs" and "outputs", but, rather, to examine the effects of parental characteristics and students' developed ability on the resource allocation decisions of parents and students. Also included is a discussion of hypothesized effects of purchased resources and students' characteristics on teachers' classroom decisions.

Chapters 4 through 7 present our empirical results. In Chapter 4 we discuss our findings dealing with the determinants of students' time allocation decisions. Students' supply of time is a measure of their investment in their own learning and an indicator of the relationship between the decisions of students and those of their parents and teachers.

Chapter 5 deals with how parents allocate time and money in order to (a) provide home instruction to their children and (b) influence the characteristics of their children's schools. Like Chapter 4, this Chapter examines the relationships between the resource allocation decisions of the principal actors -- parents, students, and teachers.

Chapter 6 deals with the chain of decisions which results in purchased resources being available for teachers and students in classrooms. The Chapter also deals with teachers' roles in combining purchased resources with students' time in the formulation of classroom technologies.

Chapter 7 deals with an often neglected dimension of equity in education, namely the content of instruction, as reflected in schools' curricula. Both (a) the nature of students' home curricula and its relevance to school curricula, and (b) the informal curricula of schools and classrooms are also discussed.

Chapter 8 summarizes the findings and presents some implications for policy formulation. Special attention is paid to the types of incentive systems which our research indicates might influence the resource allocation decisions of parents, students and teachers.

Appendix A describes our research and sampling procedures and also discusses the approaches taken in data analysis. Appendix B contains the parent interview instrument. Appendix C discusses research bearing on equity in the flows of resources to individual students in classrooms.

Footnotes to Chapter 1

[1]For a discussion of the social benefits of education, See Weisbrod (1964).

[2]While parents may base their decisions on the long term advantages for young people of devoting time to learning, students themselves may be influenced by short term considerations, including the incentives which teachers and parents provide.

[3]Garner (1973, pp. 4,7).

[4]See, for example, Garms, Guthrie and Pierce (1978, pp. 18-43).

[5]For a useful analysis of efficiency in education see Rawls (1971, pp. 66-70). Recent perspectives of efficiency in education are provided in Benson (1981) and Thomas (1981).

[6]See Heyns (1974, pp. 1434-51).

[7]This discussion has benefited from discussions of equity in education provided in Anderson (1967, pp. 21-27) and Bowman (1975, pp. 73-84). See also Rawls (1971, pp. 83-108).

[8]In his satirical essay on post-war educational reforms in Britain, Young (1958, p. 52) stated: "In the long run ambitious parents always brought to grief the best laid schemes of egalitarian reformers."

[9]In our Chapter 7 we report on inter-classroom differences in the content of instruction.

[10]James (1961, Chapter 1) presents a historical overview of school finance in the United States. He discusses the ongoing conflict between equity, efficiency, and freedom of choice.

Footnotes to Chapter 1, cont.

[11]See Coleman (1966, pp. 298-302).

[12]See Campbell and Bunnell's volume (1956) for a series of articles on the influence of national programs on the standardization of curricula.

[13]See Halpin (1963) for research on the 'climate" of schools. The "hidden curriculum" of schools is examined by Dreeben (1968) and Rutter et al. (1979).

[14]See Jencks (1972, p. 94). Also, Coleman (1966, pp. 298-302; 491-492).

[15]See Bloom (1976). His studies and those of his students suggest that mastery learning techniques may improve both equity and efficiency.

[16]In many classrooms, the "better" students are observed "finished and waiting" while their slower classmates complete their assignments.

[17]See Hansen and Weisbrod (1969). Also, Windham(1970).

[18]For a discussion of the screening role of educational systems see Layard and Psacharopolous (1974).

[19]Brown and Saks (1975, 1981).

[20]For a discussion of the equity-efficiency quandry with respect to higher education, see Schultz (1972).

[21]Dahllöf (1971) claimed that teachers adjust the pace of instruction to students who score between the 10th and 25th percentile in the aptitude distribution of the class. See Barr and Dreeben (1978, pp. 142-154) for a critical analysis of this literature.

Chapter 2

HOW RESOURCES AFFECT LEARNING
(A Literature Review)

> "A realistic appraisal of the intellectual and social development of the young requires that a child's day not be viewed as a series of distinct, unrelated experiences, but as a cohesive whole with attitudes, values and behaviors related to and affecting one another." (Medrich et al., 1982, p. 249)

Although homes and schools constitute distinct environments, they are related to each other and children's home and school experiences tend, in certain respects, to be consistent. Our purpose in this literature review and in the empirical Chapters of this Report is to examine the determinants of resource allocation decisions in homes and schools and the nature of interactions between parents, students, and educators.

There are, of course, important differences between the investment decisions made by members of educational organizations and those made by individual parents and children. Schools and school systems are established by society to help meet perceived social goals. At all organizational levels, with the partial exception of classrooms where teachers also work with students as individuals, school systems are oriented toward obtaining the social benefits of schooling by providing services for broad categories of students, while each family is motivated in their educational activities by the values, capabilities, and resources of its own members. One of our major efforts has been to distinguish between decisions intended to affect categories of students and those made by parents and students for realizing individual objectives.

The following literature review is organized around these topics. We deal first with the decisions of legislators and administrators who, in

order to bring about the social goals of education, provide financial support for broad aggregates of students. We then turn to the literature dealing with the resource allocation decisions of parents and students. We finally examine studies of resource allocation processes in classrooms, where teachers and students combine the purchased resources provided by educational organizations with the capabilities developed in children's homes to produce learning opportunities for individual students.

(1) Organizational Decisions

Because education is important to the entire society, and not merely to students and their families, modern governments support and operate school and college systems. Since individuals also have an important stake in the outcomes of schooling, there is a widespread concern over whether educational systems are equitable. The level of financing and the efficiency of educational systems are also matters of public concern. Because the preferences of individuals differ from each other and, on occasion, from the priorities of their governments, the degree of choice available to clients of school systems determines whether such systems are perceived as equitable and efficient.

In this section, we discuss some of the literature dealing with the resource allocation decisions of national, state, and local governments. We first review some aspects of the school finance literature and then turn to studies of the effects of resources on learning.

A. Issues in School Finance. Because of the perceived importance of the "social benefits" of schooling, governments provide financial support for this purpose.[1] Although this rationale for public support is widely

accepted, questions involving the optimal level of support for schooling have not been completely resolved.

(a) Levels of school support. While decisions about the level of support for schooling and other purposes are made in the political arena, economic research provides rough guidelines to which political decision makers may refer. These economic studies are based in part on the assumption that one major social benefit of public schooling is its contribution to economic growth.[2] While these studies support the principle that schooling is, on the whole, a good investment, they provide little or no guidance about how money should be allocated among primary, secondary, and higher education, among elements of the curriculum, or among broad segments of the population, including, for example, urban and rural children.

Some recent research is based on rate-of-return calculations which combine streams of costs and benefits into a single statistic, and therefore permit comparisons of the returns to alternative investments within education.[3] Many of these studies, including Freeman's analysis of the implications of the so-called "over supply of college graduates" have important implications. Studies of manpower requirements provide another dimension of the relationship between social goals and desired levels of investment. However, this approach, which is sometimes translated into projections of the supply of students with specific qualifications is often criticized on the grounds that the labor force may change in unpredicted ways, so that the possession of job-specific skills may impede workers' adaptations to new kinds of opportunities.[4]

Some economists have examined the distinction between the social and private benefits of education and the implications of this difference for educational policy. In general, educational subsidies provided by

governments enhance the rate of return to individual investments, while social rates of return are increased by the additional taxes which educated people pay.

These aggregate calculations tend to gloss over the importance of educational investments made by individuals in their own homes. Because of variations in home investments, individuals benefit in various degrees from government investments designed to provide equal opportunities for all. Inequalities are increased when educational investments of governments vary within and among states so as to compound inequalities in students' home environments.

(b) Equity in the financing of schooling. The decentralized system of educational finance in the United States results in unequal levels of expenditure for schooling. Research indicates that expenditure levels are related to (a) differences in the value of taxable property and (b) differences in the mean socio-economic status of the community -- a proxy for communities' values with respect to schooling.[5] Since the money available to school systems is used to purchase the human and material resources needed for educational services, there is a relationship between expenditure levels and the quality and quantity of these services.[6]

The constitutionality of these inequalities was questioned by Wise.[7] Partly as a result of his work, school finance systems were challenged in California and elsewhere. During the 1970's, a coalition of lawyers, political activists, and educators was successful in bringing about change in the school finance systems in a number of states. Also, in the 1960's and 1970's, the federal and state governments became involved in attempting to bring about "vertical equity" or the fair treatment of students who, because of physical, mental and emotional

characteristics or because of their home backgrounds, were unequal in their ability to benefit from the services offered by school systems.

There is a positive relationship between the average socio-economic status of a community and both its level of financial support and the amount and quality of human and material resources it may purchase. Also, at the level of the individual family, SES is related to the resources provided in the home and to families' preferences for education as opposed to other public and private goods. Well-educated families tend, on average, to live in well-financed school districts, while poorly-educated families often live in school districts with relatively meagre fiscal support.

Attempts to equalize revenues available to local school districts are justified on grounds of fairness. However, equitable finance systems are a necessary but not a sufficient condition for equalizing learning opportunities, since there is a level of decision making which separates financial support from the presence of specific resources in classrooms. Studying the organizational context of education therefore includes examining specific resources in classrooms and studying their effect on learning. This takes us, in the next sub-section, to a discussion of the "school effects" literature.

B. The School Effects Studies. Under the leadership of James Coleman, a number of scholars have examined the effect on students' learning of a variety of school characteristics. These "production function" or "input-output" studies searched for the relationship between specific resources such as books, classroom space, peer group characteristics, and teachers' attributes and the measured outcomes of schooling, when the

"background characteristics" of students are taken into account. Coleman's three concluding statements provide a useful basis for organizing our discussion.

> The first of these conclusions is that "for each group, by far the largest part of the variation in student achievement lies within the same school, and not between schools."[8]

This distinction between the among and within school components of variance in students' academic performance has important substantive and methodological implications. While many earlier studies attempted to identify the determinants of variations in average performance among schools, classrooms, or school districts,[9] recent studies focussed on the determinants of within school variation in students' achievement.[10] We begin this sub-section with a brief discussion of two recent studies concerned with among school variance, and then summarize some studies which focus on the determination of variation within schools. We also discuss briefly the approach of our Report, which emphasizes the importance of interactions between parents, students, and school organizations.

While the attention paid by education scholars to differences in students' performance within schools and classrooms has important implications for practice, it does not diminish the importance of improving overall performance. Rutter and his associates stressed the importance of identifying ways to improve the overall effectiveness of schools.[11] They justify their approach as follows:

> Raising the quality of education does not have the effect of making every one alike. This is because children vary (as a result of both genetic endowment and home experiences) in their ability to profit from educational opportunity. Improving schools will not necessarily make any difference to individual variations....But it may have a decisive impact in raising overall standards of attainment.[12]

Rather than concentrating on the effects of "school resources", Rutter et al. examined a number of "process variables", including academic emphasis, teacher actions in lessons, rewards and punishment, pupil conditions, children's responsibilities and participation in the school, stability of teaching and friendship groups, and staff organization. They found some strong relationships between these processes and the average achievement of students. However, the interpretation of their findings is complicated by the reciprocal relationships between school influences and students' characteristics, or whether "schools were as they were because of the children they admitted, or rather whether children behaved in the way they did because of school influences."[13] This problem plagues much of the social science research in education.

In another approach to the study of school effectiveness, Edmonds identified, from a reanalysis of the Coleman data, a number of schools classified as "effective" in that the relationship between successful performance and family background was eliminated in each school.[14] Edmonds argued that the existence of effective schools demonstrated the fallacy of the commonly held belief that "the family is somehow the principal determinant of whether or not a child will do well in school." He concluded, in part, that "What effective schools share is a climate in which it is incumbent on all personnel to be instructionally effective for all students."[15] He argued that politics and not social science holds the key to making schools for poor children effective. However, this dichotomy between politics and social science is of dubious merit, since interactions between parents and educators may make schools and homes more effective educational agencies, therefore enhancing the effect of both school inputs and background factors.

Some researchers who attempted to explain within-school variations in students' achievement have focussed on the effects of tracking in elementary schools and curricular placement in high schools.[16] In her analysis of the problem, Heyns argued that "If access to better teachers, counselling, and highly motivated, academically-oriented peers affects achievement to any degree, such resources should operate between curricula within schools as well."[17] In a related study, Alexander and McDill studied the factors leading to curricular placement of high school students and the effects of such placement on academic achievement and on three non-cognitive outcomes of schooling -- intellectualism, self-conceptions of academic competence, and educational plans. Access to the college preparatory track was found to depend on both ability and social class. Those who had the good fortune to be placed on the college preparatory track had resources not available to other students and tended to do better than their ability would predict on the cognitive and non-cognitive outcomes of schooling.[18]

On the other hand, after a careful examination of existing research, Jencks concluded that the effects of tracking in elementary schools and of curricular placement in high schools were either non-existing or so small as to be unimportant. He concluded that the most obvious reason for differences in students' attainment within schools, and especially the differences which result from tracking students, is that "schools do not teach everyone the same things."[19] Since a major reason for tracking in elementary schools and curricular placement in secondary schools is to adapt the content and pace of instruction to students' ability, it would be surprising if these practices did not lead to differences in the measured and unmeasured outcomes of schooling.

An important theoretical contribution to this topic was made by Brown and Saks[20] who reasoned that educators may use the resources at their disposal to bring about a desired combination of two conflicting goals -- maximizing the average level of students' performance and reducing the variance among students in performance levels. Some teachers and administrators (whom they called "elitists") may prefer to attain a high average level of performance, and can best reach that goal by devoting a disproportionate proportion of total resources to the most able students. Others (whom they dubbed "egalitarians") prefer to reduce the variance in students' attainment, and reach that goal by targetting resources to their least able students. In their 1975 article they tested this hypothesis using school district data. In their 1980 article, they examined some of the theoretical problems of measuring the allocation of resources among students within classrooms. (Some of these issues are examined in our Appendix C.)

Our approach to the analysis of resource allocation in education suggests that variance in students' achievement within schools is, in part, a function of differences in the values, interests, and capabilities which children learn at home. Because of these differences, students react in different ways to a common set of classroom resources. Hence, determining the causes of within-school variations in students' behavior implies examining, not merely differences in the purchased resources available to students, but also the interaction between homes and schools. This theme arises again when we examine Colemen's second conclusion.

> Coleman also found that: "Comparisons of school to school variations at the beginning of Grade 1 with later years indicates that only a small part of it is the result of school factors, in contrast to family background differences among communities."[21]

While Coleman's second conclusion is clearly supported by his data and by related studies, it is a rather empty statement which expresses a

statistical relationship among variables without any underlying logical model. We therefore present three possible explanations for his findings, each of which has important substantive content.

(a) Socio-economic status aggregated to the school district level may be related to school level averages of students' performance because it reflects unspecified school characteristics which are related to the average status and aspiration levels of the community.[22]

Bowles and Levin presented a statistical version of this explanation when they concluded that multi-collinearity, or the statistical relationship among independent variables artifically reduced the variance in average student performance that was attributed to school characteristics.[23] After correcting for multi-collinearity they found that the explanatory power of some school characteristics was increased. In short, the complex relationships among average SES, school characteristics, and students' achievement cannot be explained simply by using statistical controls.

(b) A second possible explanation for the correlation between the mean SES of a school and the average of students' achievement scores is that high SES parents provide a greater than average amount of instructional resources in the home, hence, affecting students' values and capabilities, and increasing their ability and willingness to profit from instructional activities. To the degree that this explanation can be empirically demonstrated, it is important to learn more about the education-related activities of parents at all SES levels, and to identify incentives which will encourage their involvement in educational activities.

(c) A third possible explanation for Coleman's second conclusion is that parents in high SES communities possess and use more political and

economic power than is available to parents in low SES communities. To the degree that this explanation is valid, increased parental involvement of parents in low SES neighborhoods is called for, as a way of making possible the use by parents of incentives which would cause educators to improve the quality of their educational services.

> Coleman's third conclusion was that "There is indirect evidence that school factors are more important in affecting the achievement of minority group students; among Negroes, this appears especially so in the south."[24]

In a follow-up of Coleman's research, Hanushek disaggregated Coleman's data in order to identify the complex relationships between school inputs, students' backgrounds, average achievement levels, and race. He found, as Coleman did, that students' backgrounds have a strong influence on their achievement and also supporting Coleman's conclusions, that some school inputs, in particular, teachers' verbal ability, are significant predictors of the achievement of both white and black students.[25] Since schools for white children have traditionally been better financed than schools for black students, it is difficult to separate the effects on students' performance of the racial composition of their classroom from the superior inputs often associated with schools for white children.

Another attempt to examine the interaction between students' characteristics and school inputs was made by Summers and Wolfe who used as their dependent variables the performance gains of individual students. Summers and Wolfe also dealt carefully with the problem of matching students with their own teachers, rather than predicting the achievement of individual students from statistical averages of teachers' characteristics.[26] They concluded that:

> "the reason educational studies have failed to find that the things schools do are effective, is that there are few things which are consistently effective for all students."[27]

They wrote further that "for many school resources, the effect on some types of students is very different -- and frequently, in the opposite direction -- than the effects on other types of students."[28]

While this research is interesting, it has limited usefulness for educational policy, for two major reasons. In the first place, we believe that it ignores important interactions between school inputs and student characteristics. The selection and assignment of teachers is not conducted in a vacuum; just as teachers' characteristics may influence students' performance, the characteristics of students may affect the type of teachers selected for specific classrooms. In addition, the migration decisions of parents and teachers may contaminate the apparent relationships between "inputs" and "outputs" since teachers often migrate in search for able students while parents are sometimes influenced, in their choice of a place of residence, by their perceptions of the quality of teaching their children will receive. (See our Chapters 3, 6, and 7.)

More significantly, input-output research implies a factory model in which students are regarded as passive recipients of educational services. In contrast to this model, many psychologists maintain that even at an early age, students participate in their own learning. As a result, attainment is a function of children's decisions as well as those of their parents and their teachers. Educational resources therefore serve primarily as indicators of the constraints and opportunities available to students and teachers as they select the ends and means of the teaching-learning process.

Despite their limitations, school effects studies reflect a perspective on decision making which provides useful insights into the operation of educational systems. The above summary has been limited to a few studies,

and should be supplemented by an examination of more complete surveys of this literature, especially those of Averch et al., Hanushek, Jencks and Murnane.[29] Studies of the allocation of resources in school systems should also be placed in a broader context by examining how resources are used for educational purposes in students' homes. We now review some research dealing with the effect on children's educational opportunities of the allocatory decisions of parents and students.

(2) Resource Allocation by Parents and Students

Education is widely believed to have private as well as social benefits. Because of these private benefits, parents and children, as well as governmental agencies invest time and money in education. The magnitude and character of these investments differ from family to family because of differences among families in (a) values concerning education, (b) the information families posses about the long term benefits of education and (c) the time and money parents have for their children's education.

Parental investments in children's education begin in the latter's early childhood and continue throughout their schooling. Our data document differences among parents of fifth grade children in the time and money devoted to support and supplement the educational activities of the school. Furthermore, parents' investments in the capabilities and motivations of their children affect both children's ability and willingness to benefit from the educational services of school systems. Finally, parents may influence the quality of their children's education by choice of a place of residence and their political activities directed toward influencing their children's schools.

In addition to providing resources for their children's home learning, parents as well as teachers set constraints on their children's use of time. Children's options concerning their choice of activities are therefore limited. Nevertheless, there is still room for choice on the part of children, and the latter may be thought of as investing in their own education. We now discuss separately the investments of parents and children.

A. Parents' Investments in Children's Education. While Coleman called attention to the effect of home characteristics on children's learning, two earlier studies at the University of Chicago stressed the importance of the socio-psychological climate of homes on children's school performance. These studies, by Dave and Wolf suggest that "what adults do in their interactions with children in the home is the major determinant of (children's) characteristics, rather than the economic status of their parents, their parents' educational level, and other status characteristics."[30] Dave showed that these home interactions affect measures of children's achievement,[31] while Wolf documented the effect of home environment on children's measured intelligence.[32]

Recent economic studies of home investments in learning have been stimulated by Gary Becker who suggested that homes should be regarded not merely as agencies devoted to the consumption of goods, but also as producers of "commodities" such as meals, entertainment, and child care.[33] As Leibowitz pointed out, child rearing is analogous to schooling:

> By the time children enter first grade, significant differences in verbal and mathematical competence exist among them. These differences reflect variations in (i) inherent ability; and (ii), the amount of human capital acquired before the age of six. The stocks of acquired human capital reflect, in turn, varying inputs of time and other resources by parents, teachers, siblings, and

> the child. The process of acquiring preschool human capital is analogous to the acquisition of human capital through schooling or on-the-job training.[34]

Some important subsequent research has focussed on parents' allocation of time and money for the care and education of their young children. Hill and Stafford used survey data to study the effect of having children in the home on the manner in which parents of high, middle, and low social class spend their time. They found that having children in the home had no effect on the time allocation of fathers. In the case of mothers, the effect of children on time allocation varied by social class: "the amount of housework time allocated to preschool child care by wives from the lowest SES group is significantly less than that allocated by the middle and high status wives..."[35] High status wives also forego a higher potential wage when they stay home with their children than do wives from middle or low status homes. Considering both the difference in time allocated and the difference in opportunity costs, Hill and Stafford estimated that "the value of nonmarket inputs invested in a child's 'capital embodiment' differs by a ratio of almost 5:1 between the high and the low SES groups."[36]

Leibowitz used several measures of home investment obtained from the Terman study of gifted children, in order to determine the effect of preschool investments on children's ability.[37] Previous research showed that the educational levels of fathers and mothers was positively related to both the amount of time parents spend with their children and the latter's IQ. Leibowitz' earlier work showed that mothers' time expenditures on children exceeded that of fathers' by a least a factor of 4.[38] Leibowitz obtained a direct measure of the time parents spend with children from the Terman data, which indicated whether parents carried out direct instruction along

specific lines, such as by reading books or telling stories to children. She found that even in this sample of very able children which, due to the constricted range of ability, might not have been expected to yield significant results, home investment was positively related to IQ for boys and older girls; also, mothers' education but not fathers' was related to children's IQ, suggesting that home investments rather than genetic factors are the main basis for the observed relationship between parents' educational level and children's ability.[39]

Murnane's study provides a useful complement to the Leibowitz' study since, in contrast to Leibowitz' data for gifted children, Murnane studied, over a two year period, two samples (of 529 and 562 children) from low income black families. Like Leibowitz, Murnane found that mother's educational level but not fathers' was related to students' achievement, again suggesting that parental effects on children's learning result primarily from environmental rather than genetic factors.[40] Murnane also found that there is no consistent evidence that children whose mothers work outside the home either part time or full time achieve less than children whose mothers do not work outside the home."[41] Murnane's study suggests that the finding that "mothers working outside the home decreases the amount of time they spend on housework but does not substantially decrease the time devoted to child care" applies to low income as well as middle class families.[42] Finally, Murnane's finding that "there are no systematic relationships between specific goods inputs and students' achievement"[43] is compatible with our view that resources act as constraints and opportunities but not as causes of learning.

It would be useful to follow up the research of Murnane and others with studies of the effects on the time allocation patterns of parents and

children of the presence in the home of books, magazines, newspapers, microcomputers, and space. Such studies would be especially useful in these days of technological change, since the purchase of home computers probably results in new patterns of time use for many families.

While researchers seldom apply the principles of economic decision making to the behavior of children, understanding the variables which affect children's time allocation at home and at school is essential to the study of investments in early education. In an important project, Medrich and his associates conducted a study of how 764 sixth-grade children in twenty Oakland neighborhoods spent time when on their own, with their peers, and with other members of their families. They gathered their data by means of interviews with the children and their parents.[44] Some of their findings are discussed in the following section.

B. Children's Time Allocation Decisions

> "Time, like money, is a scarce resource that can be spent in different ways...Time use reflects priorities and predilections, opportunities, and constraints."[45]

Medrich's research was organized around five "domains" of time use, namely: (a) activities of children on their own; (b) joint activities of children and parents; (c) jobs, chores, and spending patterns; (d) organized activities; and (e) television watching. The data provide a rich source of information about children's decisions and parental influences. The researchers found that, while parents were favorably disposed to an enriched set of out-of-school time-use patterns for their children, few of the children belonged to families which actually control children's use of time. While most parents reported they would like their children to watch less television, participate more in organized activities, and take more responsibility at home, children's actual behavior was characterized by a great deal

of television watching, little participation in organized activities, and only a small amount of responsibility around the home.[46]

The researchers conclude with a cogent statement about the importance to education of children's out-of-school activities. They remind us that, while educators have often ignored the potential contribution of parents and have even, in many cases, been antagonistic to parent-school cooperation, they are increasingly telling parents that their efforts mean a great deal. Medrich et al. also point out that it will be impossible to "devise strong strategies designed to improve children's scholastic achievement without understanding the function and substance of out-of-school time use."[47] They also conclude that "only if parents believe that out-of-school time use represents an urgent issue in terms of their children's present and future well-being can we expect any serious dialogue within families on the subject."[48]

In a related article, Benson, Medrich, and Buckley reported on the interactions between parents' involvement in students' out-of-school activities, the socio-economic status of families and schools, and students' achievement.[49] This research throws further light on the roles of parents, teachers, and students in determining the latter's educational success. It supports Medrich's contention that, in order to make effective use of the knowledge that out-of-school variables are important determinants of educational outcomes, it is necessary to study in detail what children do with their out-of-school time, both when they are "on their own" and when they are with their parents.

While parents exert varying degrees of control over children's out-of-school activities, children's freedom to select from among available alternatives is probably much greater out of school than in the classroom. Nevertheless, since children are assumed to develop fairly consistent values about the

value of time and education, we anticipate considerable continuity between their time utilization patterns in their homes and classrooms. It is therefore useful to examine the classroom behavior of teachers and students in a resource allocation framework which takes into account the interests, capabilities, and out-of-school activities of children.

(3) Resource Allocation Within Schools

Thus far in this Chapter, we have discussed the literature dealing with investments in education made by families, governmental agencies, and by administrators. Within schools and especially within classrooms the purchased and unpurchased resources resulting from these investments are combined for instructional purposes. We now discuss a sample of the literature dealing with the allocation of resources in schools and classrooms.

A careful observation of how resources are used in a cross section of classrooms reveals what might best be called "patterned diversity." While there are differences in how teachers arrange classrooms for instruction, these differences are not random but appear to be affected by external influences. We have attempted to document some of these patterns in our research, by examining phenomena observed at the levels of the school as a whole, the classroom, the instructional group and the individual student.

(a) School Level Decisions. Ferguson's research suggests that the process by which school level decisions are made is influenced by the characteristics of the parents in the communities that schools serve.[50] School level decisions influence the classroom context within which teachers and students make decisions that affect the latter's learning.

Ferguson found that in high SES schools, decisions affecting the student composition of classrooms were made by committees of teachers. In low SES communities, the same kinds of decisions tended to be made by school principals.*[51]

She also documented that in most cases where teachers made grade level decisions, they tended to track students by ability, to departmentalize the subject assignments of teachers, and to permit class size and instructional procedures to vary among classrooms at the same grade level, with the smallest classes reserved for the least able students. When student assignment decisions were made by school principals, classes were not tracked, subject assignments were not specialized and instructional practices were relatively uniform across classrooms at the same grade level.[52] These findings suggest that community preferences affect the organization of schools with high SES communities preferring collegial decision making and low SES communities preferring a more hierarchical arrangement.

There has been considerable controversy about the practice of tracking in the elementary grades and tracking practices vary considerably. Assigning students to relatively stable tracks at the beginning of their formal schooling and providing only limited opportunities for movement from one track to another is quite different from temporary tracking for specific purposes. Since students' abilities differ across subjects, using a single criterion such as reading ability for tracking the entire curriculum may have different results than grouping by ability within each subject area.

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* The reader is reminded of our previous caveats concerning the size and selection of the sample of schools. These reservations are reiterated *a fortiori* in the case of Ferguson's study in which there were some missing data.

One purpose of tracking may be to reduce the frustration inherent in the teacher's task by placing all difficult or slow students in a single classroom. This procedure also permits the teacher to give special attention to those students who benefit most from direct instruction. This interpretation is supported by Ferguson's research, which indicates that when teachers make student assignments, they place smaller numbers of students in the slow track.[53]

A more general rationale for tracking is to improve the achievement of all students by permitting an adaptation of the content, methods, and pace of instruction to differences in students' ability levels. However, while tracking may reduce the variance in students' characteristics within classrooms, it does not eliminate them. If teachers use grade-wide tracking as an excuse for ignoring individual differences within classrooms, students may be worse off under tracking than with heterogeneous grouping. There have been many studies of the effects of tracking on students' performance. After reviewing a number of these studies, Jencks concluded that "elementary school tracking had little effect on cognitive inequality."[54] Jencks reported a National Education Association review of 50 studies dealing with the effects of tracking on students of different ability levels. At each of three ability levels, results were inconclusive with some studies indicating that tracking increased performance while others indicated a lower level of performance in tracked than in untracked classrooms.[55]

Studies of the effects of class size on students' performance have been inconclusive. Some studies showed an inverse relationship between class size and achievement gains, while others found no significant differences.[56]

(b) Classroom Level Decisions. Decisions made at the classroom level are in some respects analogous to school level decisions since teachers decide whether or not to group students by ability within the classroom as well as how many students to assign to each group. Grouping in classrooms is also a means of transforming the total stock of purchased resources into resource flows to individual students and groups. Harnischfeger and Wiley categorized the types of classroom organization as whole group instruction, subgroups, and individual seatwork.[57] They asserted that grouping and individualization strategies depend on pupil characteristics, subject area, curriculum, resources, and teachers' preferences. They also maintained that these strategies determine the cost of the resources that are directed to each individual student.[58]

Until recently, there have been few detailed studies of classroom level behavior. One important exception is the research of Lewin, Lippitt and White, who studied the effect on students' behavior of alternative forms of teacher leadership.[59] More recently, in an exemplary sociological study, Barr and Dreeben focused on organizational solutions to instructional problems in primary grade classrooms.[60] They explained classroom grouping as constituting strategies for adapting instruction to differences in students' aptitudes, especially in reading. The number of groups that are formed, and the ability composition of each group are determined, in large part, by the size of the total class, the variance in student ability, and especially, the numbers of very slow students assigned to the classroom.[61]

Fifth grade classrooms are, of course, quite different than the primary grade classrooms studied by Barr and Dreeben. Despite substantial differences in students' aptitudes within given fifth grade classrooms, teachers often forego grouping as an approach to adapting the content,

pace, and methods of instruction to individual differences. When grouping occurs, its purpose may be to vary the mix of instructional technologies and therefore to differentiate resource allocation.

In order to study instructional technologies, it is therefore necessary to turn our attention to the instructional group.

(c) The Level of the Instructional Group. One purpose of grouping within classrooms is to adapt instructional proceedings to students' characteristics.[62] For example, since the more able students have surplus time after formal performance standards are reached, an appropriate set of technologies might be for the teacher to provide direct instruction to the less able students while the faster students work independently on research assignments. Such differentiation helps to avoid wasting the time of faster or slower students who tend to be bored or lost when the same instruction is provided to all, regardless of ability.

A second function of grouping has more to do with the resources provided by students than with the purchased resources of schools. This is the use of cooperative group instruction in which "children work together toward some common end, task or goal." Stodolsky postulates several categories of peer instructional groups, including totally cooperative groups in which "group members' actions and rewards are inter-dependent," helping groups in which "children no longer share a common goal, but are in a group," and helping groups in which children are working on the same assignment with mutual assistance expected. Peer tutoring includes the case where "one child is considered more expert than the other(s) and assistance is meant to flow from the tutor to the tutee."[63]

In this discussion of resource allocation decisions at the level of the school, the classroom and the group, we have reported on a variety

of outcomes, including tracking (a school level variable), grouping at the classroom level, and the choice of instructional procedures at the level of the group. Missing, thus far, is a discussion of the behavior of individual students. We turn now to this final level of analysis.

(d) The Level of the Individual Student. Learning is an attribute of individuals and not of aggregates. Because of unique capabilities, interests and home environments, students benefit to different degrees from a common set of resources.[64] For these reasons, it is desirable to examine the influences of schooling on individual students.

While many prior studies of educational opportunities have utilized data identified at or aggregated to the level of the classroom, the school, or the school district, there have been few efforts to measure the flow of school resources to individual students. This omission is readily explained -- the kinds of published data that are readily available to researchers (such as district level expenditures per pupil, parental SES, and teachers' demographic characteristics) represent characteristics of school systems that affect substantial numbers of students. Measuring the resources that flow to individual students is a much more difficult task that presents some still unresolved conceptual problems.

In one of the earliest attempts to measure resource flows, Harnischfeger and Wiley presented an accounting model intended to trace personnel costs to the level of the student.[65] The main difficulty of this approach, clearly indicated by Brown and Saks, is its failure to distinguish between the concepts of jointness and separability in production.[66] Thus, when a teacher addresses a class of 20 students at one time, the entire cost of the teacher's salary may be either assigned to each of the students (jointness) or divided by the number of students in the class (separability).

Since jointness in production is ubiquitous in education, simple accounting approaches to calculating resource costs for individual students oversimplify the case. In most classrooms, a complex mixture of jointness and separability is probably the best depiction of reality. Monk attempted to resolve this issue, using data gathered in our study. He found a slight tendency for high ability students to receive more resources than students of low ability within the classrooms included in our sample.[67]

The conceptual and methodological issues associated with interpreting individual level data are discussed in Appendix C. Our own theoretical approach to identifying the correlates of individual level educational outcomes is found in Chapter 3. Chapter 4 contains our analysis of variables identified and measured at the individual level of analysis, while Chapter 6 incorporates our attempt to measure resource flows to students within classrooms.

Footnotes to Chapter 2

[1]The concept of social benefits is discussed by Friedman (1962), Weisbrod (1964), and Windham (1976).

[2]See Schultz (1961), Denison (1962), and Bowman (1964).

[3]Hansen (1963); Becker (1964); Welch (1973); and Freeman (1975).

[4]See, for example, Windham (1973, 1976, 1980).

[5]James (1962).

[6]Cubberly (1905); Mort (1960); and Thomas (1968).

[7]Wise (1967).

[8]Coleman (1966, p. 297).

[9]See, for example, Thomas (1962), Coleman (1966), and Katzmann (1971).

[10]Brown and Saks (1975, 1980, 1981); Bernstein (1980).

[11]Rutter et al. (1979).

[12]Ibid., p. 7.

[13]Ibid., p. 181.

[14]Edmonds (1979, p. 21).

[15]Ibid.

[16]Jencks (1972, pp. 106-109).

[17]Heyns (1974, p. 1425).

[18]Alexander and McDill (1976).

[19]Jencks (1972, p. 107).

Footnotes to Chapter 2, cont.

[20]Brown and Saks (1975, 1980, 1981).

[21]Coleman (1966, p. 297).

[22]Conversation with Dan C. Lortie (1983) concerning his ongoing research.

[23]Bowles and Levin (1968a, 1968b).

[24]Coleman (1966, p. 297).

[25]Hanushek (1972).

[26]Summers and Wolfe (1975).

[27]Ibid., p. 7.

[28]Ibid.

[29]See Averch et al. (1972), Hanushek (1972), Jencks (1972), and Murnane (1981) for extensive reviews of this literature.

[30]Summary from Bloom (1976, p. 2).

[31]Dave (1963).

[32]Wolf (1966).

[33]Becker (1965).

[34]Leibowitz (1974, p. S111).

[35]Hill and Stafford (1974a, p. 331).

[36]Ibid., p. 332.

[37]Leibowitz (1974).

Footnotes to Chapter 2, cont.

[38]Leibowitz (1972) as cited in Leibowitz (1974, p. S116).

[39]Leibowitz (1974, pp. S128-S129).

[40]Murnane et al. (1981, p. 372).

[41]Ibid., p. 374.

[42]Ibid.

[43]Ibid.

[44]Medrich et al. (1982).

[45]Ibid., p. 14.

[46]Ibid., p. 230.

[47]Ibid.

[48]Ibid., p. 244.

[49]Benson et al. (1980).

[50]Ferguson, dissertation research in progress.

[51]Ibid.

[52]Ibid.

[53]Ibid.

[54]Jencks (1972, pp. 106-108).

[55]Ibid., p. 108.

[56]Glass et al. (1982).

[57]Harnischfeger and Wiley (1981, p. 227).

[58]Ibid.

Footnotes to Chapter 2, cont.

[59]Lewin, Lippitt, and White (1939).

[60]Barr and Dreeben (in press).

[61]Ibid.

[62]Crowbach and Snow (1977).

[63]Stodolsky (1981, pp. 19-21).

[64]Jackson (1968, p. 17).

[65]Harnischfeger and Wiley (1981, pp. 235-247).

[66]Brown and Saks (1980).

[67]Monk (1979).

Chapter 3*

TOWARD A THEORY OF RESOURCE ALLOCATION IN EDUCATION

> "It is hard to think of forms of human capital that the individual can acquire as final goods -- he has to participate in the creation of his human capital. His own abilities...the quality of co-operating inputs, the constraints and opportunities offered by the institutional setup -- all determine the 'technology,' or the production function. Together with the relevant factor prices, the properties of the production function determine the optimal way in which any quantity of human capital is to be produced and determine the cost of production." (Ben-Porath, 1967, p. 352)

The term "human capital" is used by economists to stand for the capabilities individuals develop as a result of educational investments. Human capital is quite like physical capital, since both are produced by the expenditure of time and money, and both are invested to produce streams of future benefits. Like physical capital such as factories and machines, human capital may depreciate and become obsolete. Unlike physical capital, human capital, which is embedded in human beings, cannot be bought and sold.

The value of both kinds of capital can be equated with either the cost of its production or the value of the benefit streams resulting from its use.[1] While rate of return studies compare the cost and benefit streams associated with a given amount of capital, education production function studies focus on the purchased inputs used to produce an intermediate rather than a finished product and therefore frequently ignore the investment value of students' developed capabilities.

This emphasis on the cost side of the equation raises analytic problems in education, as investments are made in homes as well as schools. Because homes and schools interact with each other, attempts to use statistical

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*Note: Readers may omit this Chapter withour losing the main theme of the report.

procedures to separate these sources of investment are virtually meaningless.[2] Furthermore, students' capabilities are produced over time, and the spacing of investments may affect the amount and kind of learning which is produced.

We have therefore found it useful to concentrate on the effects of students' present capabilities on the future investments of time and money which are made by students, parents, and educators. The human capital of young students is considered valuable because it affects present and future rates of learning as well as the propensity of all concerned to make additional investments. In other words, this research attempts to explain the time allocation behavior of children, parents and teachers, rather than, as in many previous studies, average or individual gains in achievement.

(1) Introduction

The choices made by public agencies and by parents and children result in opportunities and constraints which affect behavior in homes and classrooms. These relationships are symbolized, in this Chapter, by an expanded "production function" which incorporates the investments of all members of the systems within which learning is produced.

Governments are motivated by the existence of important social benefits to ensure that educational services are made available and that, up to a given age, individuals avail themselves of them. Governments achieve this purpose in at least two ways. First, they are -- in most countries -- directly involved in producing educational services and making them available to qualified members of the population. Second, by subsidizing the cost of educational services, governments lower their price to individual families, and hence increase their consumption of schooling.

Private investments in education take a variety of forms. Parents spend time and money to purchase goods and services like books, private tutoring, and out-of-school lessons.[3] Parents also combine their time with purchased goods and services and with the time of their children to "produce" a variety of kinds of home instruction.[4] Parents also "purchase" public school services by paying taxes and even deciding, if their income permits, to reside in a neighborhood where educational (and other) services as well as the level of taxation approximate their own preferences.[5] In addition, many parents subsidize public education by helping their children at home with school related activities, thus reducing the cost to school systems of providing basic instruction.[6]

Children, as well as parents and education agencies, invest in learning. In fact, children's willingness to allocate time for their own education may constitute a necessary if not a sufficient condition for learning to take place. While children are self-motivated with regard to learning, the benefits they derive from devoting time to learning as well as their (non-monetary) costs may be altered as a result of the incentive-producing behavior of parents and teachers.

Although parents and teachers use incentives and constraints to influence how children spend their time, the decisions made by the students themselves are at the core of the resource allocation systems of homes and classrooms. When children are young, parents and, subsequently, teachers have a predominant influence over their allocation of their time. When children grow older and as their capabilities increase, they become more and more autonomous in their decision making, while their options, which now include their ability to use time for income-producing employment, expand.

(2) The Production of Learning

Our research is based on a modified production function model which includes the following considerations. First, learning is cumulative, and the learning which results from investments at one point in time becomes an input into further learning in subsequent time periods.[7] Second, two types of resources are central to the production of learning: the opportunity costs of parents' and students' time and the inputs purchased by families and school systems.[8] A third consideration in the modified production function model is that the relationships among independent variables often represent incentives and constraints which may be as important to the production of learning as the relationships and interactions between the independent and dependent variables. Each of these ideas will be explored in the remainder of the Chapter, after the outline of the model is presented.

It is assumed that the amount of new learning (or human capital) which individuals acquire in a given period of time depends on (a) the learning they have accumulated through prior investments of time and money, (b) the amount of time they devote to learning, (c) the amount of time and money parents devote to their children's learning and (d) the total amount of purchased goods and services made available to children in their classrooms. This formulation is condensed in Equation 3-1.

$$\text{Equation 3-1:} \quad Q_{i,t} = g\{s_{i,t}K_{i,t-1} ; PT_{i,t} ; PM_{i,t} ; D_{i,t}\}$$

where $Q_{i,t}$ is the flow of new human capital produced by individual "i" in time period "t"; $K_{i,t-1}$ is the stock of human capital of individual "i" at the beginning of time period "t", and $s_{i,t}$ is the fraction of his total time which individual "i" devotes to the production of new learning during time period "t". $PT_{i,t}$ is the time provided by parents of student "i" during time

period "t" and $PM_{i,t}$ is the value of purchased resources used by parents for the home education of student "i" in the same time period. $D_{i,t}$ represents the purchased resources provided at school for student "i" in time period "t".

In technical terms, the regression equations in Chapters 4, 5, and 6 represent efforts to estimate the supply functions for the resources provided by students, parents, and school systems. The inter-relatedness of decisions is demonstrated by our use of the dependent variable in one supply equation as the independent variables in one or more of the other equations.

Elaboration

(a) $Q_{i,t}$ is the flow of new human capital in a given time period. For economists, whose valuation of increments in schooling is equated to the additional earning power this schooling represents, measuring the "value added" by an increment in schooling is a straightforward (but still complex) process. For psychometricians, who are assigned the task of measuring increments in students' achievement, there are other problems, two of which we discuss briefly.

First, there are difficult technical problems associated with attempting to measure gains in achievement by means of standardized achievement tests administered at two points in time. In her excellent summary of this issue, Heyns reported that "Cognitive growth...must be assessed in the context of longitudinal data. While it is clear that there is no substitute for accurate and reliable longitudinal data, achievement scores over time raise as many questions as they answer."[9]

The other problem is that the content of instruction varies from classroom to classroom, so that differences in achievement measures may reflect the varying instructional content of classrooms as well as new learning.[10]

Also, differences over time in the content of instruction may be associated with variations in students' ability within classrooms. For example, in a fifth grade classroom including students of differing abilities, high ability students may complete an assignment in less time than students of relatively low ability. In such a situation, the high ability students may be assigned additional work at a higher cognitive level, or even in a different subject, while the teacher provides intensive help for the slower students. The subject enrichment provided to the faster students is not always measured by standardized achievement tests, and the "value added", though real and important, may go unrecognized.

In addition to the problems which are involved in defining and measuring $Q_{i,t}$, there are a variety of complexities in specifying the right hand side of Equation 3-1.

(b) Measures of inputs: opportunity costs of students' time. An important characteristic of the revised production function is the inclusion of students' time as an input in the production of learning. Unlike other inputs (such as the time of teachers, classroom space, and library books), students' time is not purchased, and can only be valued in terms of the opportunities which are foregone when time is used in one way rather than another. Economists, who have long maintained that the value of the time older students devote to learning can be measured by the dollar value of their foregone earnings, have given little or no attention to the value of the time of younger students. Yet, recognizing the value of the time of all students is necessary if schools are to be run efficiently, and if appropriate procedures are to be used for analyzing how learning is produced.[11]

Students' time has value because students can select among a variety of educational (or leisure time) activities at a given point in time. These

activities include the use by students, parents, and educators of alternative curricula, tracking procedures, and educational technologies. By selecting a given set of educational procedures, the decision maker is foregoing the use of alternate ways to transform students' time into learning. Hence, while young children do not (in our society) forego earnings by being in school instead of at work, they do forego learning by being involved in one educational activity rather than another.[12]

Valuing students' time by the learning which is foregone when time is used in one way rather than another focuses attention on the second part of the "sK" expression, namely, students' measured ability at a given point in time. The more able the student, the more valuable are his or her learning opportunities; hence, ability is synonymous with the value (in terms of foregone learning opportunities) of students' time. Both economists and psychologists have been interested in the relationship between time and students' ability. Concepts developed by John Carroll provide important insights into this relationship. He pointed out that:

> "It is also well known...that pupils vary a great deal in the rate at which they learn -- some learn very fast, others much slower, but, despite these differences in rate of learning, nearly all pupils can learn what they are supposed to learn in school, given enough time."[13]
> "The amount of time that a student needs to learn a given task under optimal learning conditions is, in the author's opinion, a reflection of some basic characteristic or characteristics of the student that may be called aptitude."[14]

Carroll's definition of aptitude corresponds to what we might call the "learning productivity" of students, which may be defined as the amount of time students take to master a given amount of new learning or, alternatively, the amount of learning a student can master in a given period of time. Christofferson (1971) pursued this approach and developed a theoretical procedure for estimating the "shadow price" of students' time.[15]

Students' ability varies across the elements of the curriculum, especially when the total curriculum is assumed to include activities such as athletics, music, and fine arts which are sometimes called "extra-curricular", and which are often carried on at home as well as in school. When the value of students' time varies across subjects, the opportunity cost of using time for academic activities is equal to the value to the student of using time for his or her "best subject." Thus, when a student excels in a given subject, whether it be honors physics, Olympic-class skating, or football, the disparity between the value of time in these subjects and other aspects of the curriculum may be great, with a corresponding danger that students' priorities and time allocations may be distorted.

(c) Measures of inputs: purchased resources. Purchased resources have three types of influence on students' performance. First, these resources may affect learning directly, as when a parent or a teacher explains a concept, or when a motion picture is used to help students understand a phenomenon such as the economics of the petroleum industry. Second, some kinds of inputs -- especially the time of teachers, parents and students, as well as workbooks, classroom space, and computers -- act as organizers which affect the manner in which students' time is combined with other inputs. Third, inputs which have a monetary value may be used as incentives to encourage students to allocate time to learning. For example, by spending time to help their children with homework, parents may increase the benefits children experience from this activity, while reducing its psychological cost; hence children may increase the amount of time they devote to homework.

The resource inputs which are included in Equation 3-1 are provided by three types of decision makers, namely, students, parents, and educators. Hence, educational systems, in which the clients are directly involved in the production process, are markedly different from most business organizations, in which managers are assumed to determine the companies' ends and means. Also, the individuals who are involved in the production of education provide, through their resource allocation decisions, a variety of incentives and constraints which affect the behavior of other participants. These interactions are discussed in the next section.

(3) Interactions

From the point of view of the school system as a whole, inducing students to devote time to learning is a worthwhile form of activity since it does not involve the direct expenditure of money, and since students who are involved in learning activities are, in effect, subsidizing the efforts of the school system.

Since attendance at school is compulsory and since parents and teachers often exercise considerable control over children's behavior, students are under some pressure to devote time to learning. Such direct pressures cannot readily be applied to parents, who are assumed to be motivated by their preferences for and within education to supply varying amounts of time and money to their children's education. One form of incentives to parents is provided by students themselves whose decisions to provide time to learning may cause parents to supplement children's time with their own time and purchased resources. Also, teachers sometimes assign homework in which parental involvement is required. For example, teachers often ask parents to listen to their children read.

The tendency of parents and students in a given educational system to supply their own time for the improvement of children's learning may also influence the behavior of educators. To begin with, students' and parents' preferences with respect to the former's schooling may influence teachers to migrate from one school district to another or within large school systems. It has been demonstrated by several researchers that teachers within school systems tend to move from schools serving low SES students to schools with a more advantaged clientele.[16] Since SES may be only a proxy for the school characteristics which affect teachers' migration, the presence of interested parents and motivated students may be an underlying factor which affects teachers' non-monetary rewards and hence their own motivations and efforts. Also, it has been shown that high quality school systems tend to be characterized by a relatively high value of real property, suggesting that the characteristics of schools influence the supply and demand for residential property in school districts.[17] School board members may therefore have economic reasons for adopting educational policies which attract interested parents and motivated children. Finally, the educational investments parents and students make at home and in school subsidize school systems, by lowering the cost of providing basic instruction in the skill subjects. Because of these subsidies, school systems have "spare" resources for broadening the curriculum, thus encouraging families who place a high value on an expanded school curriculum to move to a given school system.[18]

In our attempt to determine the nature of the incentive systems which affect the behavior of parents, students, and teachers, we have conducted a comprehensive study of resource allocation in homes and classrooms. The design of this research is described briefly in the next section and in more detail in Appendix A.

(4) Summary

The quantity and quality of educational services which are available to children result from decisions made by families and school systems. These decisions have different origins; decisions made in school systems are affected by shared perceptions of the benefits provided by schooling to the entire society; families' decisions to invest in children's education are affected by the perceptions of parents and children about the costs and benefits of schooling.

While educators are often depicted as being at the core of educational systems, they have only a limited influence over the investments which parents and children make in children's education. Indeed, parents may often influence teachers' classroom behavior, while children may affect the time and other resources provided for them by parents and teachers. These interactions result in a complex system in which each group of decision makers (parents, students, and educators) provides opportunities and constraints which affect members of the other groups.

Since the learning which takes place in homes affects school systems' ability to attain their goals, teachers and other educators use a variety of inducements to encourage parents to supply time and money for their children's learning, and to persuade students to supply time to their own education, both at home and in school. Administrators, parents, and (especially) students provide incentives which encourage teachers to utilize appropriate instructional procedures and curricular content. By identifying the determinants of the resource allocation behavior of students, parents, and teachers, we hope to discover the nature of incentive systems which would make school systems more efficient.

Our analysis also throws light on the sources of inequality in the provision of education. Not surprisingly, we will demonstrate that some inequalities originate in children's homes, and are related to the socio-economic status and preferences of parents. Other inequalities are associated with differences among students in their willingness to supply their own time to education, both at home and at school.

The analysis presented in the following Chapters reflects the view that education takes place at home as well as at school, and that educational systems include parents and students as well as teachers and administrators. These systems are characterized by sets of opportunities and constraints whereby the various members of the total system attempt to influence the resource allocation behavior of other decision making groups. Administrators have a special responsibility for establishing a variety of incentives which will affect the behavior of the various participants in children's education.

Footnotes to Chapter 3

[1]Fisher (1912, pp. 23-32) discusses the cost and investment values of capital.

[2]Bowles and Levin (1968A, 1968B).

[3]See Chapter 5.

[4]Becker (1976, pp. 89-114).

[5]Wimpelberg (1981).

[6]Leibowitz (1974, pp. S128-S129).

[7]Ben Porath (1967).

[8]Becker (1976, pp. 89-114).

[9]Heyns (1980, p. 46).

[10]Berliner (1980, p. 193) shows that in the classes he studied there were wide variations in teachers' allocation of time among topics in the curriculum. He states that "standardized achievement tests...have one overwhelming flaw; they simply may not reflect what was taught in any one teacher's classroom." (p. 192)

[11]Schultz (1961, p. 82) suggested that "it is plausible that all too little has been done to economize on the time that students put into education." Unfortunately, he did not extend this argument to include the time of young students who, in our society, are precluded by law from entering the labor force.

[12]This distinction between foregone learning and foregone earning was suggested by Mary Jean Bowman, in an earlier discussion.

[13]Carroll (1971, p. 29).

Footnotes to Chapter 3, cont.

[14]Carroll (1971, p. 31).

[15]Christoffersson (1971, pp. 114-115).

[16]Greenburg and McCall (1974); Turnbull (1976).

[17]Pashigian (1972).

[18]See our Chapter 7..

Chapter 4

STUDENTS AS DECISION MAKERS

> "Human beings need not be driven to explore, to think, to learn, to dream, to seek out problems for solution; they are intrinsically constituted to do just this." (Getzels, 1974, p. 536)

(1) Introduction

Much of the literature dealing with resource allocation in education is apparently based on the assumption that schools resemble factories in which students, who are regarded as the "raw materials" of educational systems, are passive recipients of educative services. However, it is more in keeping with psychological thought to view students as active participants in their own learning, who select goals and seek out the means to attain them.[1] Although children do not participate in the financial decisions of school systems, they exercise an important influence on the educational process by allocating their own time and by influencing the resource allocation processes of parents and teachers.

Teachers and parents have an important influence over how children spend their time, but there is a "zone of discretion" in which students make decisions at home and in school about the time and effort they devote to specific learning activities. Within this discretionary zone, the way in which students spend their time has been shown to affect their learning.[2] An important contribution of parents and teachers is, therefore, to provide incentives which will motivate children to devote time to learning.

We begin the Chapter with a conceptual analysis of students' time-allocation decisions. The second part of the Chapter reports the results of our empirical examination of variables associated with students'

allocation of their own time. These variables provide clues about the incentives parents and teachers may use to influence students' supply of their own time.

(2) Approaches to a Theory of Students' Time

The time which students supply for learning is the main resource at their disposal, and is analogous to the purchased resources used in educational systems.[3] An important aspect of the decisions of teachers, parents, and students is the manner in which they combine students' time with purchased goods and services. In addition to obtaining purchased resources and combining them with students' time, parents and teachers use a portion of the resources at their disposal as incentives to encourage students to increase the time they supply to their own learning.

Whether the "value" of students' time is measured by its production cost or by its contribution to further learning, there are no grounds for assuming that the time of elementary school students is costless. This is not a trivial issue, since assuming that the time of young children is costless can lead to wasteful administrative, curricular, and instructional procedures.[4] We consider first the issues involved in assigning a value to students' time and, second, the implications of this approach for combining students' time with other goods and services in the production of learning.

A. The Value of Students' Time. There are two closely related ways of viewing the time of students, even when they are young. First, the value of students' time at any age incorporates the cumulative effects of previous investments of time and money made for the children by parents, teachers, and the students themselves. As a result of differences in previous

investments, the "value" of students' time (as measured by students' acquired capabilities) therefore varies from student to student. The second approach starts with the capabilities a child has developed at a given point in time. Students' time is then viewed as a resource which, combined with other resources, is "invested" in the production of new learning. Students "spend" their time studying at home and in school; the amount and quality of time they spend influence new learning. Ultimately, of course, the capabilities students develop through these investments may be transformed into income streams; however, there are many intermediate steps between the investment of the time of young students and the point at which they enter the job market.

We assume that parents, teachers and students take the specific capabilities of children into account when they make decisions which will result in learning. While the time of all children is a valuable resource, we speculate that decision makers are often concerned with the use of the time of the most and least able students. The opportunity costs of these children are especially high -- the former, because wasting their time implies foregoing much learning; the latter because improving their learning skills may make educational systems more equitable and more efficient (See Chapter 1).

Assigning a value to students' time which depends on their present capabilities does not imply taking an elitist view of education. Indeed, the fact that the time of some students has more value as an investment in further learning than that of others helps clarify the problem of equity in classrooms. Considering students' present ability levels to be the result of unequal past and current investments and an indication of the distribution of their future opportunities suggests possible procedures for equalizing these opportunities.

The recognition of the investment value of students' time brings into focus one important difference between this analysis and other discussions of the value of students' time. Some recent research has focussed on the time that is provided to students in schools and homes. For example, one well publicized study reported that the length of the school day and the school year may have a significant effect on students' learning.[5] This emphasis on the provision of instructional time and other resources to students also highlights the importance of avoiding procedures which waste students' time, such as administrative interruptions, or requiring faster students to wait idly after completing a lesson, while slower students catch up.

We focus on a different dimension of the problem, namely, the time provided by students who make choices between spending time on learning activities and on such other activities as socializing, daydreaming, or watching television. Recognizing the importance of the time allocation decisions which are made by students also draws attention to the role of teachers and parents in providing incentives which increase the benefits and reduce the costs which children perceive to be associated with devoting time to learning.[6]

While the time horizons of young children are relatively short, parents are assumed to be aware of the long term values of education. Their awareness accounts, in part, for the institutionalization of formal education and for the incentives parents and teachers supply to persuade children to be actively engaged in immediate learning activities. Parents pay a large proportion of the costs of children's education, since they allocate time and money at home, pay taxes to support schools, buy books and magazines, pay tuition for out-of-school lessons, and, in some cases, either

pay for private schooling or take up residence in communities which offer schooling and out-of-school learning opportunities which parents value (See Chapter 5).

From the point of view of educators, recognizing the value of students' time implies (a) avoiding its waste, and (b) considering alternative uses of students' time. Assigning a low value to students' time implies that these choices are unimportant, while assigning a substantial value to students' time implies that curricular and pedagogical alternatives are of great importance. Instructional procedures may therefore vary among classrooms, schools, and communities as a result of the differing values which parents and students assign to students' time. We will discuss this type of issue in Chapters 6 and 7.

B. Students' Time and Purchased Resources. Students' time is combined with other resources, including the time of their parents and teachers as well as with books and materials in the production of learning. Under certain circumstances, students may substitute their time for unavailable or scarce resources; for example, some students may spend time in the library to make up for inadequacies in the resources they receive at home or at school. Under other circumstances, the availability of purchased resources of good quality and adequate quantity may cause students to spend less rather than more time for learning. The following are examples of interactive relationships among the input variables.

(a) Interactions between the quantity and quality of students' time. We hypothesize the existence of two types of interactions between students' capabilities and the amount of time they contribute to learning. First, the amount and quality of the time students supply to their own

learning may act as substitutes for each other; for example, able students who complete their assignments in a relatively short time period may waste time in class and may avoid homework, while less able students may apply themselves diligently to classroom assignments and spend additional time on homework to "catch up" with their peers. Alternatively, students whose ability levels are relatively high may spend additional time on academic activities because they receive positive reinforcement from teachers and parents; similarly, less able students who receive less positive reinforcement, may spend less than the average amount of time on academic activities at home as well as in school.

(b) Students' time and purchased resources. Since learning usually involves combining time with human and material resources, the availability of resources at home and in school may encourage students to spend additional time on education-related activities. For example, the presence of a well stocked library at school, at home, or in the community may encourage students to develop an interest in reading and to increase the amount of time they devote to learning. The presence of a computer in their home may result in students devoting time to the learning of skills which are not part of their formal educational requirements, while the availability of a piano may encourage children to take piano lessons and to devote time to the study and practice of music. On balance, then, we hypothesize that the availability of educational resources is likely to increase students' allotments of time to learning.

(c) Students' time and the organization of classrooms. The manner in which teachers organize their fifth grade classrooms may be thought of as a set of resource allocation procedures. In many classrooms,

especially those in which students are not tracked for ability, teachers provide separate instruction to individuals and groups of students. These differentiated procedures enable teachers to combine their own time, with that of students, and with material resources so as to adapt curricular and instructional procedures to students' capabilities (Chapter 6).

(d) Home resources and students' time. At home as in school, instructional resources may have contradictory effects on students' willingness to supply their time for learning. For example, parents' supply of their time for teaching their young children may enhance children's ability to learn, and hence reduce the amount of time children need to master specific tasks. Also, parents may pay for the services of a tutor, or use their time to help children with learning difficulties, again reducing the amount of time children require to complete their assignments. However, the availability of home resources may, under some circumstances, actually increase the amount of time students provide for education-related activities.

(e) Students' allocation of time at home and in school. Finally, we ask whether students who spend more time on education-related activities in the classroom also spend more than the average amount of time on homework and similar activities, or whether time spent on educational activities in one of these contexts is a substitute for time spent in the other context.

The relationships between students' decisions to allocate time at home and in school may take several forms, depending in part on the practices of the teacher or teachers who are involved. If, for example, the teacher's policy is to have students complete at home the assignments they

do not finish during school hours, there may be a strong tendency for children to work hard at school (using all their discretionary time) in order to avoid taking work home. However, some slower and less motivated students may be inclined to waste time at school; in this case they may need to spend more time at home in order to complete their assignments. Finally, if there are strong incentives to spend time in academic activities in both homes and schools, students may utilize most of their available time in school and may spend additional time on these activities in their homes as well.

We now report on our empirical study of the determinants of children's decisions to provide time for learning, at home and in school.

(3) Students' Allocation of Time in the Home

While children have some control over the manner in which their time is used at home and in the classroom, their activities are more structured in classrooms than in most homes. The manner in which their time is allocated among subjects within classrooms is influenced by educators, who use powerful sanctions in their attempts to control students' time allocations to subjects and activities. In homes, on the other hand, children retain partial independence in their use of time, although there are substantial differences among families in the amount of structure which parents impose.[8]

In our home interviews, we asked parents to estimate the number of minutes a week their fifth grade child was engaged in a variety of activities, including homework, out-of-school lessons, recreational reading, sports, hobbies, youth organizations, and watching television. We classified homework, out-of-school lessons, and recreational reading as "academic" and sports, hobbies, youth organizations, and television watching as

"non-academic." Table 4-1 indicates that, on the average, watching television took about 15 hours a week of the time of the average child, while the least popular activity -- participation in youth organizations -- required only about one hour a week. Furthermore, parents of only two children of the 250 reported that the latter spent no time watching television, while 148 out of 250 parents reported that their children spent no time on youth organizations.

Table 4-1

Student Allocations of Time at Home
(Minutes per week)

Activity	N	Means	SD	Range
Homework	249(246)	246.81	173.16	0-870
Lessons	249(153)	127.46	160.98	0-960
Recreational Reading	250(245)	314.49	255.98	0-1320
Sports	248(193)	216.85	250.03	0-1560
Hobbies	248(196)	263.94	318.93	0-1700
Organizations	250(102)	62.36	100.23	0-600
TV	250(248)	904.90	470.33	0-2520
Academic Activities	250(250)	686.26	360.64	35-2040
Non-Academic Activities	250(243)	277.48	366.50	0-1560
All Activities	250(250)	963.74	432.83	105-2640

Note: Numbers in parentheses represent those cases in which students' time allocations are not zero.

The following pages examine the determinants of the amount of time children in our samples spent on three types of academic activities (homework, out-of-school lessons, and recreational reading) and one form of non-academic activity, namely, watching television. We will note that (a) the determinants of time allotments vary among these activities and that (b) the various activities in which children are engaged compete for the limited amount of total time which is available to all children, after schooling, meals, and sleep are taken into account.

A. Determinants of Homework Time. Homework is an extension of learning at school. In most cases, homework consists of assigned activities, including completing exercises not finished in class, writing reports, and preparing for the next day's recitation.

We hypothesized that the amount of time students devote to homework would be influenced by their own ability, the quality of their home environments, the decisions of teachers to assign homework, and the pressure of competing activities, including those which are examined in this section. The two key variables in our analysis of homework time are (a) students' ability; and (b) the educational level of their mothers.

i. Our analysis in Chapter 3 suggests that students' ability is negatively related to the amount of time they need to master a given amount of learning. If, therefore, similar exercises are assigned to fast and slow students, we expect that students of relatively low ability will require more time for its completion than students of relatively high ability.

ii. The level of their mothers' education is assumed to be a proxy for the quality of human resources which are provided for children in their homes. The presence of high quality human resources may result in children spending more time on homework, or it may enable children to complete their assigned homework in a relatively short period of time. This relationship between students' ability, mother's education, and children's homework time is explored in Tables 4-2 and 4-3.

Table 4-2

Student Allocation of Time to Homework
(Minutes per week)

		Mothers' Educational Attainment: High (More than 12 years)	Mothers' Educational Attainment: Low (12 or less years)	
Student Reading Ability (Percentile Ranks)	High (69-99)	N = 69(68) Mean = 228.84 SD = 150.61 Range = 0-630	N = 39(39) Mean = 265.90 SD = 200.56 Range = 5-870	Mean = 242.22
	Middle (32-68)	N = 48(48) Mean = 236.02 SD = 166.92 Range = 30-720	N = 49(47) Mean = 211.90 SD = 162.94 Range = 0-750	Mean = 223.84
	Low (1-31)	N = 17(17) Mean = 359.12 SD = 174.16 Range = 150-720	N = 27(27) Mean = 267.78 SD = 192.98 Range = 30-840	Mean = 303.07
		Mean = 247.94	Mean = 243.33	

( ) = Number of students whose time is greater than zero.

Before we discuss Table 4-2 and the other analyses reported in this Chapter, we call attention to the limitations of our data and the implications of these limitations for the subsequent interpretations. The description of the research reported in Appendix A emphasizes that data were gathered only from fifth grade classrooms in urban and suburban school districts in a single metropolitan area; the findings are not necessarily applicable to other grade levels or other parts of the country.

More important than the geographic limitations of the data are the sampling problems we incurred. For several reasons, including (a) the importance of maintaining a cooperative relationship with the parents, teachers, principals, and superintendents who participated in the study and (b) the

legal requirements for "informed consent" by the parents of students involved in the study, our final sample of students, schools, and school districts did not meet the strict criteria of randomness. We have some reason to believe that, in the case of children and parents, the resulting sample was biased, in a manner which may have influenced the findings. It is possible, for example, that parents who provided consent for their children to participate in the study may have been more sympathetic to the goals of the research than those who did not consent. Our findings are, for the above reasons, tentative, and the statistical results must be thought of as descriptive rather than inferential.

The column marginals in Table 4-2 show no overall differences among SES categories in students' time allotments for homework. Among ability groups, there is a negative, linear relationship between students' ability and the time spent on homework by high SES students. This finding supports our hypothesis that students devote sufficient time to homework to enable them to complete work not finished in class. The time they require for this purpose is, according to our definition inversely proportional to their ability.

Our data suggest that, in the case of low SES students, those of low ability are encouraged to spend additional time to complete their work, while high ability students may be encouraged to maximize their performance by spending a greater than average amount of time on homework.

Since the amount of time children spend on homework depends, in part, on the homework policies of schools and individual teachers, the homework time of students includes a school and classroom effect, as well as a set of influences which are specific to students and their families. Table 4-3

controls for school effects by using as the dependent variable the deviation from the classroom mean of students' time allocations for homework. When the classroom effects are controlled in this manner, the marginals, as well as the columns for mothers' education show homework time to be greater for children of high and low ability levels than for children of middle ability. In addition, with the exception of low ability students, children of mothers with less education are likely to spend more time on homework than children of well educated mothers. As we will see in the next section, these results are partly explained by examining how children allocate their time to other academic activities.

Table 4-3

Within Class Differences in the Amount of Time Students Devote to Homework (Minutes per week)

Pooled within Classroom Analysis

		Mothers' Educational Attainment		
		High (More than 12 years)	Low (12 or less years)	
Student Reading Ability (Percentile Ranks)	High (69-99)	N = 69(68) Mean = -14.46	N = 39(39) Mean = 45.90	Mean = 7.34
	Middle (32-68)	N = 48(48) Mean = -26.43	N = 49(47) Mean -13.22	Mean = -19.75
	Low (1-31)	N = 17(17) Mean = 27.10	N = 27(27) Mean = 24.55	Mean = 25.53
		Mean = -13.47.	Mean = 15.70	

( ) = Number of students whose time is greater than zero.

B. Students' Time Spent on Out-of-school Lessons. The second category of time devoted by children to academic activities in the home includes a variety of types of lessons which support and extend the work of the school, including lessons in foreign language, religion, and aesthetic subjects such as music and dance.

Table 4-4

Student Allocation of Time to Out-of-School Lessons
(Minutes per week)

		Mothers' Educational Attainment		
		High (More than 12 years)	Low (12 or less years)	
Student Reading Ability (Percentile Ranks)	High (69-99)	N = 68(40) Mean = 111.25 SD = 135.14 Range = 0-510	N = 39(24) Mean = 138.77 SD = 178.64 Range = 0-690	Mean = 121.28
	Middle (32-68)	N = 49(37) Mean = 180.02 SD = 181.57 Range = 0-750	N = 49(27) Mean = 100.90 SD = 142.96 Range 0-630	Mean = 140.46
	Low (1-31)	N = 17(10) Mean = 150.88 SD = 236.72 Range = 0-960	N = 27(15) Mean = 90.0 SD = 105.66 Range = 0-360	Mean = 113.52
		Mean = 141.43	Mean = 111.18	

( ) = Number of students whose time is greater than zero.

The allocation of students' time to specific activities, including out-of-school lessons, can be partly explained by considering the total matrix of activities which compete for children's attention. Among the children of well educated mothers, those who fall in the category of middle ability spend the least amount of time on homework and the greatest amount

of time on lessons. This suggests that homework is an activity of relatively low priority for children who are neither especially bright nor especially slow; the additional time at their disposal is spent on lessons which expand or enrich the activities associated with schooling (Tables 4-3 and 4-4). The trade-offs are less clear in the case of children whose mothers are less well educated; for these children, the provision of lessons is positively related to ability levels. The trade-off here is partly between lessons and homework, and even more strongly (as we will see) between lessons and television.

C. Students' Allocation of Time to Recreational Reading. We now turn in Table 4-5 to a third type of activity which is closely related to schooling, namely, the amount of time students allocate to reading which is not integrally related to their homework assignments.

Table 4-5

Student Allocation of Time to Recreational Reading
(Minutes per week)

		Mothers' Educational Attainment		
		High (More than 12 years)	Low (12 or less years)	
Student Reading Ability (Percentile Ranks)	High (69-99)	N = 69(68) Mean = 406.01 SD = 283.84 Range = 0-1200	N = 39(38) Mean = 370.08 SD = 275.76 Range 0-1207	Mean = 393.04
	Middle (32-68)	N = 49(49) Mean = 314.41 SD = 260.06 Range = 30-1320	N = 49(47) Mean = 255.31 SD = 214.96 Range = 0-900	Mean = 284.86
	Low	N = 17(17) Mean = 163.47 SD = 146.96 Range = 15-450	N = 27(26) Mean = 202.93 SD = 144.70 Range = 0-600	Mean = 187.68
		Mean = 342.22	Mean = 281.93	

( ) = Number of students whose time is greater than zero.

The patterns in Table 4-5 are consistent and in the expected directions. The Table supports the hypothesis that the mother's education, a proxy for their own values and reading habits, influences children's allocation of time for reading. Also, within each level of mothers' education, there is a linear relationship between students' ability levels and the time they devote to reading. The one exception to the pattern is that, among low ability children, those whose mothers have a low educational level spend more time on recreational reading than do low ability children with well educated mothers.

D. Students' Time on All Academic Activities. We conclude this section of the analysis by examining the determinants of the time students spend on all the above academic activities, namely, homework, lessons, and recreational reading. We use a multi-regression model which enables us to examine the simultaneous effects of several independent variables. While this approach provides a good measure of the linear effects of the various independent variables, it conceals the curvalinearities which were displayed in the previous tables.

The independent variables included in this analysis are:

(1) Mother's educational level. This variable is an indicator of the quality of human resources available in a child's home. It is a proxy for parents' attitudes toward education, and hence reflects the likelihood that parents will provide incentives and constraints to affect children's allocation of time.

(2) The amount of time parents spend helping children with academic activities in their homes. This is a direct measure of the quantity of resources utilized in the home to support children's learning.

(3) The amount of time children spend watching television. This variable represents one of the major activities which compete with academic activities for children's time.

(4) Sex. The amount of time children spend on out-of-school activities is partially related to their sex. On the basis of previous studies of the effect of sex on out-of-school activities, we hypothesize that girls will spend more time than boys on academic activities in the home.[9]

Table 4-6 reports that a significant effect on the time children spend on academic activities in the home is exerted by (a) the educational level of their mothers; (b) the amount of time parents spend helping their children with academic activities in the home; and, (c) the sex of the child. Because some of the more interesting relationships in Table 4-6 are shown in the zero order correlation matrix but disappear in the regression analysis, we report on each independent variable separately.

(a) Mothers' educational level is positively related to the amount of time children spend on academic activities, positively related to the amount of time parents spend helping their children with academic activities, positively related to children's reading ability, and negatively related to the amount of time children spend watching television. (Note: The positive relationship between mother's educational level and the sex of the child is probably a result of bias in our sampling procedure.)

(b) The amount of time parents spend helping their children with academic activities is positively associated with the level of mother's education, positively related to the time children spend on these activities, and negatively related to the amount of time children spend watching television. This finding is an important one, because it shows that, even when parental status is controlled, the actual behavior of parents may influence children's investments in their own education.

Table 4-6

Factors Related to Student's Allocation
of Time to Learning at Home

Variables

Dependent Variable:

SACTIME: Total time (in minutes per week) spent by students on academic activities, defined as including homework, out-of-school lessons, and recreational reading.

Independent Variables:

MOMED: Number of years of schooling completed by the student's mother.

PARTIME: The number of minutes per week spent by parents helping children with academic activities in the home.

TVTIME: The number of minutes per week spent by the student watching television.

RABILITY: The student's score on a standardized test of reading comprehension.

SEX: Female = 2; Male = 1

Correlation Coefficients

	SACTIME	MOMED	PARTIME	TVTIME	RABILITY	SEX
SACTIME	1.0000					
	.0000					
	253					
MOMED	0.2439	1.0000				
	.0001	.0000				
	253	253				
PARTIME	0.4699	0.0898	1.0000			
	.0001	.1545	.0000			
	253	253	253			
TVTIME	-0.2150	-0.3010	-0.0763	1.0000		
	.0006	.0001	.2267	.0000		
	253	253	253	253		
RABILITY	0.1807	0.2636	-0.0604	-0.2097	1.0000	
	.0042	.0001	.3215	.0008	.0000	
	250	250	250	250	250	
SEX	0.3220	0.1286	0.2104	-0.2643	0.1397	1.0000
	.0001	.0410	.0008	.0001	.0272	.0000
	253	253	253	253	250	253

Table 4-6, cont.

Regression Analysis

VARIABLE	STANDARDIZED B VALUE	PARAMETER ESTIMATE	STANDARD ERROR
INTERCEPT	0	2.0224	0.1840
MOMED	0.1228	0.0144*	0.0064
RABILITY	0.0926	0.1022	0.0600
PARTIME	0.4774	0.1959*	0.0221
TVTIME	-0.0853	-0.0567	0.0357
SEX	0.1626	0.0963*	0.0320

R Square = .3550 F Ratio = 26.86
Prob > F = 0.0001

*indicates that the parameter estimate is at least twice the standard error

(c) The amount of time children in our sample spend watching television is negatively related to the time they spend on academic abilities, negatively related to their mothers' education, and negatively related to their ability. Clearly, television watching cuts into the amount of time children have available for homework, reading, and lessons; however, the degree to which television detracts from the time available for these other activities is greater for less able children with less educated mothers than for their more able, high SES counterparts.

(d) Students' reading ability is positively related to mother's education, and the amount of time children spend on academic activities at home, while it is negatively related to children's expenditure of time for watching television. Hence, the success of the school in teaching children to read may have the side effect of increasing their time investments in home based learning and even of reducing the time they spend watching television.

(e) Finally, girls spend more time on academic activities and less time watching television than do boys. They also receive more parents' time, partly because girls are more likely than boys to enroll in out-of-school lessons -- a time consuming activity for parent-chauffeurs (Table 5-5).

E. We turn, finally, to students' time allotments to watching television, a major non-academic activity which competes for students' time with homework, recreational reading, and lessons. Table 4-7 reports on the relationships between students' reading ability, their mothers' educational levels, and students' allocation of time for watching television. Table 4-7 confirms the findings of Table 4-6; students' television watching is negatively related to both their ability and their mothers' educational level. While differences among the means of the cells are not great (between 2/3 and 2 2/3 hours per day), the direction of the differences is disturbing. Students whose academic performance suggests a greater than average need to spend time with academic activities and students whose mothers have a relatively low level of education spend a more than average amount of time watching television.

Table 4-7

Student Allocation of Time to Watching Television
(Minutes per week)

		Mothers' Educational Attainment: High (More than 12 years)	Mothers' Educational Attainment: Low (12 or less years)	
Student Reading Ability (Percentile Ranks)	High (69-99)	N = 69(67) Mean = 740.13 SD = 394.49 Range = 0-1560	N = 39(39) Mean = 1014.87 SD = 497.98 Range = 300-2520	Mean = 839.34
	Middle (32-68)	N = 49(48) Mean = 763.98 SD = 386.88 Range = 0-1860	N = 49(49) Mean = 1010.51 SD = 516.94 Range 120-2160	Mean = 887.24
	Low (1-31)	N = 17(17) Mean = 1017.82 SD = 570.44 Range = 300-2100	N = 27(27) Mean = 1160.15 SD = 393.02 Range = 120-1800	Mean = 1105.16
		Mean = 783.76	Mean = 1047.12	

( ) = Number of students whose time is greater than zero.

In contrast to other studies of students' activities in homes and schools, we were able to gather data concerning the behavior of the same students in both homes and schools. We now report our findings concerning the allocation of time by the project students in classrooms.

(4) Students' Allocation of Time in Classrooms

There are differences within homes and classrooms in students' willingness to allocate their time to learning activities. Even when classroom activities are carefully structured by teachers, there is considerable variation in the way in which students use their time. Some students devote most

of their available time to activities which are prescribed by their teachers, while others spend a considerable portion of classroom time socializing, day-dreaming, and engaging in disruptive activities.

Measuring students' use of time in classrooms is a difficult and costly task; however, it is a worthwhile undertaking, since the tendency of students to be "on" or "off" task in the classroom has important implications for educational efficiency. Our procedures for gathering these data are described in Appendix A. At this point, it is sufficient to point out that students were observed at regular intervals, and the specific behavior of each student at each observation was described and coded. The purpose of the pooled within classroom procedure is to remove the classroom effect on students' involvement.

Table 4-8

Factors Related to Student's Involvement
in Learning in Mathematics Classrooms

(Second and Third Year Data Only;
Pooled Within Classroom Analysis)

Variables

Dependent Variable:

DPON:	The proportion of the individual student's observations coded "on task" in mathematics minus the mean of the project students in the class.

Independent Variables:

DMABILITY:	The individual's percentile rank on a standardized test of mathematics minus the class mean.
DPARTIME:	The number of minutes per week the student's parents spend assisting with math homework minus the mean time project parents in the class assist with homework.
DMOMED:	The number of years the project student's mother attended school minus the mean of the project mothers in the class.
SEX:	Female = 2; Male = 1.

Table 4-8, cont.

Correlation Coefficients

	DPON	DMABILITY	DPARTIME	DMOMED	DSEX
DPON	1.0000				
	.0000				
	151				
DMABILITY	0.4275	1.0000			
	.0001	.0000			
	148	148			
DPARTIME	0.0320	-0.0444	1.0000		
	.6968	.5921	.0000		
	151	148	151		
DMOMED	0.2285	0.2020	-0.0907	1.0000	
	.0048	.0138	.2683	.0000	
	151	148	151	151	
DSEX	0.2088	0.1759	0.1743	0.2122	1.0000
	.0101	.0325	.0323	.0089	.0000
	151	148	151	151	151

Regression Analysis

VARIABLE	STANDARDIZED B VALUE	PARAMETER ESTIMATE	STANDARD ERROR
DMABILITY	0.3512	0.0013*	0.0003
DPARTIME	0.0371	0.0001	0.0002
DMOMED	0.1288	0.0057	0.0034
DSEX	0.1304	0.0246	0.0148

R Square = .2096

F Ratio = 9.54
Prob > F = .0001

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* indicates that that the parameter estimate is at least twice the standard error

Since the Analysis in Table 4-8 is conducted at the level of the individual student, the independent variables include the characteristics of students and their parents. We postulate that students' involvement in learning will be positively related to their capabilities (or ability to transform time into learning), positively related to parents' contribution of time to their children's learning (assumed to be an incentive for children also to invest of their own time), and positively related to parents' social class, a proxy for parental attitudes toward education. We also postulate that girls, who spend more time than boys in academic activities at home will be more likely to be on task in the classroom.

The regression analysis in Table 4-8 indicates that the only variable which is significantly related to students' involvement in classroom activities is their ability, as measured by standardized tests in mathematics. For our sample, then, the more able students were on task for a greater proportion of the observations than were students of lesser ability.

While the other variables in the regression analysis were not significantly related to students' involvement in classroom activities, it is instructive to examine the zero order correlation matrix, since interactions among the independent variables may conceal their joint effects on the dependent variable. Thus, mothers' education, while significantly related to students' ability, is even more strongly related to students' involvement in their assigned task. We therefore conclude that the status of students' parents (a proxy for a number of SES-related variables, including parents' attitudes toward their children's education) is, together with the value of students' time, a predictor of students' tendency to be involved in the prescribed classroom activities. On the other hand, the

time parents supply to students' home activities does not affect students' involvement in their classrooms. Hence, parental involvement, which appears to affect students' allocation of time to home-based academic activities, does not affect students' classroom behavior.

Our correlation matrix shows that girls are more likely than boys to be on task in the classroom. However, sex is related to mathematics ability on which the girls in the sample scored higher than boys, so the sex effect on student involvement disappears in the multiple regression analysis.

We turn next to an examination of the relationship between students' time allocation decisions at home and in school, asking whether students who invest their time in learning at home are likely to do the same in school, or whether students may substitute a heavy investment of time in one context for a smaller investment in the others. We again test the proposition that students' ability is a major determinant of their tendency to invest time in learning. We also examine the possibility that students' ability in interaction with students' decisions to allocate time for education at home influences their involvement in classroom learning activities.

Table 4-9 reports a two way analysis of variance between students' time allotments in the two contexts.

Table 4-9

The Relationship Between Time Allocated to Learning at Home and in Mathematics Class by Ability (Second and Third Year Data Only)

Variables

Dependent Variable:

PONMATH: The proportion of a students' observations in mathematics coded "on task".

Independent Variables:

HOME TIME: The number of minutes per week the student spent on homework, lessons and recreational reading. High, middle and low home time are based on the cumulative frequency for the variable. High = 569 or greater minutes a week; middle = 284 to 568 minutes; and low = 283 or fewer minutes.

MABILITY: The student's percentile rank on a standardized test of mathematics. High ability = 50th percentile or greater. Low ability = less than the 50th percentile.

Analysis of Variance

SOURCE	DF	SS	F VALUE	PR > F
HOME TIME	2	0.1031	5.26	0.0062
MABILITY	1	0.3974	40.55	0.0001
HOME*MABILITY	2	0.0168	0.86	0.4276

Descriptive Statistics
Math Ability

		High	Low	
		PON MEAN		
TIME ON ACADEMIC ACTIVITIES IN THE HOME	High	.82	.72	.78
	Middle	.81	.70	.77
	Low	.77	.60	.70
		.81	.69	

In Table 4-9, the main effects of (a) the time students provide for activities in the home, and (b) students' ability in mathematics, are significantly related to the dependent variable, the students' involvement in classroom mathematics activities. Hence, students who devote their time to learning activities in their homes are more likely than students who devote less time to such activities to be on task in school. Also, students' ability is positively related to students' tendency to allocate their time to mathematics lessons. However, the interaction between home time and ability does not contribute to an explanation of the variance in students' classroom involvement in mathematics.

These findings support the proposition that students' willingness to supply time to learning is a generalized tendency, manifested in both homes and classrooms. Students' ability turns out to be a consistent predictor of their time allocation behavior in both contexts. While less consistent, parental status is the other important determinant of students' time allocation behavior in both contexts.

In order to better organize our findings, we summarize our findings in Table 4-10. The variables discussed in this Chapter are not a complete list of the factors which cause students to allocate time to academic activities in the classroom. In Chapters 6 and 7, we examine the relationship between students' time allocation behavior in classrooms and selected classroom level variables including (1) curricular variables and (2) types of classroom technology.

Table 4-10

Summary of Findings:
Student Allocation of Time

TABLE	DEPENDENT VARIABLE	INDEPENDENT VARIABLES	FINDINGS
4-1	Students' Allocation of Time at Home (Univariate Statistics)		
4-2	Students' Time on Homework	Students' Ability, Mothers' Education (MOMED)	When MOMED is high, student ability is negatively related to time on homework. When MOMED is low and overall, the relationship between ability and time on homework is curvilinear, with middle ability students spending the least time.
4-3	Students' Time on Homework (Pooled Within Classroom Analysis)	Students' Ability, MOMED	For all students, regardless of whether MOMED is high or low, the relationship between ability and time is curvilinear, with middle ability students spending the least time. Overall, students whose mothers have less education spend more time on homework.
4-4	Students' Time on Lessons	Students' Ability, MOMED	For high MOMED students there is a curvilinear relationship between ability and time, with middle ability students supplying the most time. For low MOMED students, there is a positive relationship between ability and time on lessons. Overall, students whose mothers have high educational levels devote more time to lessons.

Table 4-10, cont.

TABLE	DEPENDENT VARIABLE	INDEPENDENT VARIABLES	FINDINGS
4-5	Students' Time for Recreational Reading	Students' Ability MOMED	For both high and low MOMED students, there is a positive relationship between ability and time allocated to reading. Except for the Low ability students, there is also a positive relationship between MOMED and time spent reading.
4-6	Students' Time on All Academic-related Activities at Home (Regression Analysis)	Students' Ability, MOMED, Parents' Time, TV Time, Sex	Students' allocation of time is significantly related to MOMED, Parents' Time, and Sex. Girls devote relatively more time to these activities than do boys.
4-7	Students' Time Watching TV	Students' Ability, MOMED	Students' time watching TV is negatively related to both ability and MOMED.
4-8	Students' Involvement in Classroom Activities	Students' Ability, MOMED, Parents' Time on Academic-related Activities at Home, Sex	Students' involvement is significantly related to ability, MOMED and sex.
4-9	Students' Involvement (Analysis of Variance)	Students' Allocation of Time to Academic-related activities at Home, Students' Ability	Students' classroom involvement is significantly related to both ability and time spent at home on academic-related activities.

(5) Conclusions

Most previous studies of resource allocation in education have focussed exclusively on how money is obtained, distributed, and spent. The studies include the implied assumption that the availability of money has an indirect influence on how children learn. However, the effect of fiscal decisions on learning is, as yet, unclear.

We assume that purchased goods and services are combined to produce educational environments which are conducive to learning and that a portion of the total available resources is used to provide incentives for students to be involved in the production of their own learning. Our purpose has therefore been to examine students' contributions of their time and the variables which are associated with students' time allocation decisions.

We found that two kinds of variables are associated with students' supply of time for learning. The first of these is their developed ability which (a) results from prior investments of time and purchased resources and (b) can be used as an input into further learning. The second type of variable which influences students' decisions consists of the resources provided for students in their homes and classrooms. Parental status is a proxy for the quality of resources available to children in their homes.

Students' ability is a significant predictor of students' supply of time to learning in their homes and classrooms. This finding was predicted from theory; since the more able students have a better than average capacity to transform time into learning, they will tend to provide time for learning at home and in school. This finding has two implications. First, inequalities tend to reinforce themselves, since those who have already developed a high level of ability tend to invest their time (to a greater than

average degree) in additional learning. Second, from the point of view of the educational system, the finding legitimizes efforts made in many school systems to enhance the time value of low achievers at all ages, but especially in the early grades. These investments in "learning to learn" have the dual effect of improving the ability of "target" children to achieve, and also creating conditions under which these students will invest heavily of their time in the further development of their capabilities.

The Chapter also suggests that parents' allocation of time for their children's education induces a comparable form of investment activity on the part of their children. Hence, if parents can be induced to devote part of their time to helping their children with homework and related activities, the children will themselves spend time to develop their learning skills. Furthermore, if children devote time to academic activities in their homes, they are more likely to be on task in their classrooms.

The next step in the analysis consists of an examination of the allocation by parents of resources for their children's education. We turn to this topic in Chapter 5.

Footnotes to Chapter 4

[1]Getzels (1974).

[2]Carroll (1963, p. 29) suggested the following formulation:

Degree of school learning = (Time spent)/time needed.

Since "time needed" is, according to Carroll, determined by a student's aptitudes, which are, at a given point in time, fixed, learning is a function of the time provided, as well as of the quality of instruction. See also Bloom (1974) for an overview of empirical studies concerning time and learning.

[3]Students' time is analogous to purchased resources because of possibilities for substitution. For example, some dedicated individuals who do not have access to expensive schooling make up for this deficiency by long hours of study. At the other extreme, foreign service officers are sometimes assigned to resource intensive foreign language courses where purchased resources are substitutes for the (valuable) time of the learner.

[4]Schultz (1961, p. 82) wrote that "It is plausible that all too little has been done to economize on the time that students put into education."

[5]Wiley and Harnischfeger (1974).

[6]See Medrich et al. (1982, pp. 14-15).

[7]Bloom (1974, p. 48).

[8]Medrich et al. (1982, p. 7) state that "The substance of out-of-school life is the product of many opportunities and constraints linked to family, peer groups, neighborhood, and community environments."

Footnotes to Chapter 4, cont.

[9]Medrich et al. (1982, p. 6569) report that a larger proportion of girls than boys reported homework and reading as things they like to do when alone.

[10]See Bloom (1974) for a discussion of the relationship between "time on task" and learning.

Chapter 5

EDUCATIONAL INVESTMENTS OF PARENTS

> "Parents not only set the tone for many time-use decisions, they also affect the child's values concerning time use. Their impact is even more direct when they establish rules and controls, facilitate some kinds of behavior and forbid others, make demands on children's time and permit certain choices." (Medrich et al., p. 244)

(1) Introduction

Parents, and teachers as well, affect how children spend their time at home and at school. Parents play the dominant role since they influence the manner in which children spend their time both before and after the latter enroll in school.

The manner in which parents use the resources available to them affects children's educational environments in a variety of ways. First, parents use their time and money to make possible direct instruction by parents, tutors, churches and other organizations. Second, parents use part of the resources at their disposal to influence children's allocation of time to learning at home. (For example, by purchasing a home computer, they encourage children to "educate themselves" in its use.) Third, parents have an important influence on the formal schooling their children receive. This influence includes parents' selection of a place of residence and their attemps to influence the behavior of their children's teachers, school principals, and school boards. In addition, parents affect their children's schooling indirectly, since skills developed at home help determine children's ability and willingness to benefit from school-based instruction.

The organization of this analysis parallels that of Chapter 4. We also examine parents' use of money, and consider the determinants of parents' residential choices.

(2) The "New Home Economics"

A useful approach to the study of parents' resource allocations for their children's education has been developed by a number of economists, under the leadership of Gary Becker.[1] Their work, usually called the "new home economics" explains such phenomena as fertility rates, marriage, divorce, and investments in education.[2]

While previous theories of consumption were based on the idea that households derive utility directly from goods and services (such as automobiles, homes, books, and concerts), the new home economics is based on the notion that homes resemble small firms which combine the time of their members with basic market goods such as theatre tickets, lettuce, soap, medicine, hair cuts and books, in order to produce commodities such as meals, entertainment, child rearing, good health, and education.[3]

There are three major elements in this approach to the production of children's capabilities (or "child quality") in the home. The first element consists of the preference structures of families, defined as the amount, quality, and content of children's learning that individual families prefer. The second element in this approach is the "production function" which relates the time and money provided by parents to the learning which results. This function subsumes the "technology" of home instruction, consisting of the specific mix of time and purchased goods used by parents to educate their children. The third element includes the constraints imposed by limited resources and the efficiency of their use.

The theory is elegant in structure and forms the basis of many economic studies of the formation of human capital in homes. Thus far, however,

the human capital approach has not been used to adequately treat the complex trade-offs among the elements of the curricula to which children are exposed at home and at school. Equally important, it has not been used to explain the gradual divergence which occurs between the preferences of parents and children when the latter begin to mature. In particular, the human capital approach has not yet dealt with the complications which are encountered when, after children reach the age of five or six, instruction is jointly provided by homes and schools. The main value of the "new home economics" for our work therefore rests in its theoretical structure, and especially in the manner in which it deals with parents' and students' time. In addition, empirical work based on the theory helps set the context for our research.[4]

(3) The Child, the Family, and the School

Parents, teachers and children all make resource allocation decisions which influence children's learning. The members of each of these groups provide both constraints and opportunities which affect the resources which the other groups provide.[5] Understanding educational systems therefore requires examining the interactions among individuals and categories of individuals. It requires, in particular, identifying and estimating the effects of incentives educators may use to affect both the time and money provided by parents, and the time students supply to their own learning at home and in school.

The most important resource used in educational systems, namely, the time of students, also encompasses the capabilities which students possess.[6] While these capabilities result from prior investments, they are also inputs

into further learning.[7] Since students' capabilities are identical with their learning productivity,[8] our theory suggests that subject- and student-specific abilities influence the resource allocation decisions of parents, teachers, and students themselves.[9] We therefore begin this discussion of interactions among students, teachers, and parents with a consideration of the effects of students' capabilities on the decisions of parents to supply time and money for their children's education.

(a) Students' capabilities and parents' resource allocation. We have assumed that a partial motivation for parents' investments in their children's learning is the improvement of students' learning productivity, that is, their subsequent ability to transform time into learning.[10] The postulated relationship between students' abilities and parents' investments may take at least two forms. First, many parents of highly talented students may make larger than average investments, due to their belief that students' later success (at school and at work) will justify this investment. Second, parents of less able students may also make a larger than average investment in order to increase the learning ability of these students and hence remedy their disadvantage.

Parents' investments in their children's education may be affected by generalized perceptions of educational goals. If, for example, the perceived goal of parents and teachers is to bring students to a predetermined level of performance in specific curricular areas, parents whose children have readily reached this level may reduce their time commitments, while parents of low achieving students may supply additional time to enable their children to meet the required standards. If, on the other hand, performance is seen as open ended, and the goal is to "maximize" students' performance, parents may spend time with high ability students (who are efficient learners)

rather than with low ability students for whom the additional investments do not produce the desired results.

This interaction between students' ability and parents' allocation of time and money can be illustrated by introducing another dimension of education, namely, variations in the curriculum.. In the lower order skill subjects, such as primary school arithmetic and spelling, where the goals of instruction are clear and finite, the time parents supply may be inversely proportional to students' ability. In more complex subjects such as piano playing, electronics, or astronomy, where the concept of mastery lacks meaning and where attainment levels are virtually open-ended, we may expect parents to supply resources in direct proportion to students' ability.

It is, of course, obvious that there is an interactive relationship between parents' resource allocation decisions and students' achievement. Thus, while students' specific capabilities may influence parents' use of time and money, parental investments may also be expected to influence the learning of their children. Also, while the resource allocation behavior of parents is influenced by students' present ability levels, the latter result from investments made over time, by parents, students, and school systems.

(b) Interactions between the time allocation decisions of parents and children. Because of children's dependence on their parents and the intimate interactions among family members, parents affect children's values concerning the use of time, and provide constraints and opportunities which affect children's behavior.[11] It is also well known that, even during their infancy, children influence the manner in which parents spend their time.[12] We have therefore structured our analyses in Chapters 4 and 5 so as to facilitate a comparison between parents' and children's use of time. Because parents' values are developed earlier than those of their children, we assume

that similarities between parents' and students' time allocation patterns partially reflect parental influences. However, since school age children are developing their own values and are also exposed to the values of their peers and teachers, similarities between the behavior of parents and students may be attributed to interactions among family members, rather than to any dominance of parents over children.

(c) Classroom effects on parents' time allocations. We infer from the behavior of teachers and school principals that they are aware of the importance of encouraging children to devote time to their education. Teachers are, for example, expected to motivate children to be involved in classroom activities, while principals attempt to reduce such time-wasting behavior as class cutting and truancy. Teachers also assign homework, in order to encourage students to extend their academic activities into the home. Some homework activities (such as requiring children to read to their parents) are especially designed to involve parents as well as children; in other activities (such as social studies projects) home resources, including parents' time, work space and reference books are implicitly required. Parent-teacher conferences are an additional method for involving parents in children's schooling.

Another common form of parental involvement consists of the joint financing (by parents and school systems) of a variety of activities, including music lessons, boy scout meetings, and swimming instruction. By subsidizing the cost of such activities, both families and school systems reduce each other's costs, and encourage the expansion of the home and school curricula.

(d) Parents' substitution between time and money. A major difference between parents' and children's resource allocation behavior is that the former provide money as well as time for children's education. The mix

of time and purchased goods and services parents provide depends partly on the effectiveness of various resource combinations and partly on parents' income, which is also an indicator of the cost of parents' time.

High income families may, for example, be able to use both money and time for their children's education since one or both parents may be free to devote time at home or through such activities as travel and attendance at plays and concerts. Some high income families may decide, however, that neither parent can afford to forego the high income which is associated with their employment, and may use more purchased resources and less time for their children's education. Relatively low income families, on the other hand, may need to substitute inexpensive child care services for their own time, because they cannot afford to stay at home with their children. Hence, parental status is expected to influence the mix of time and money parents use for home-based education of their children.[13]

We will test these hypothesized types of interaction in the following sections, where we will present our empirical findings concerning the resource allocation behavior of parents.

(4) Parents' Investments of Time in Children's Education

In children's pre-school years, parents' time is the major component of their investments in their children's education. After children enter school, the balance shifts in favor of the purchased goods and services which are associated with public and private schooling. However, even when children attend school, parents' investments of time and money continue to be an important element in children's education since these investments affect children's learning both directly (through home based teaching) and

indirectly (through the effect of parents' resource allocation decisions on children's ability to learn at school).

In this section, we report the results of our investigation into the determinants of parents' decisions to allocate time for their children's education. We deal specifically with the following kinds of investments:

a. Parents' time spent helping children with homework;

b. Parents' time spent facilitating children's participation in lessons in such subjects as art, music, dancing, and foreign languages.

We begin this section by reporting the univariate statistics of parents' allocation of time to children's out-of-school activities (Table 5-1).

Table 5-1

Parental Allocation of Time to Children's Out-of-School Activities (Minutes per week)

Activity	N	Mean	S.D.	Range
Parental Time on Homework	247 (221)	83.86	96.72	0-600
Parental Time on Out-of-School Lessons	249 (139)	50.43	97.40	0-860
Parental Time on Sports	250 (151)	71.69	104.13	0-532
Parental Time on Hobbies	248 (124)	66.74	160.47	0-1200
Parental Time on Youth Organizations	250 (77)	26.23	81.27	0-980
Parental Time on Academic Activities (Homework & Lessons)	250 (231)	125.31	139.82	0-978
Parental Time on Non-Academic Activities (Sports, Hobbies & Youth Organizations)	250 (215)	164.12	219.75	0-1351
Parental Time on All Activities	250 (245)	289.44	263.52	0-1455

( ) Number of parents whose time contributions are greater than zero

A. Determinants of parents' time allocations for children's homework.

As Table 5-1 indicates, there is considerable variation among homes in the amount of time parents contribute to children's out-of-school learning activities. Table 5-2 and the succeeding Tables provide a partial explanation for this variation. Table 5-2, which should be examined in conjunction with Table 4-2 (children's allocation of time to homework) shows the effect on parents' time allocations of (a) the educational level of mothers, and (b) children's reading ability.

Table 5-2

Parental Allocation of Time to Children's Homework
(Minutes per week)

		Mothers' Educational Attainment: High (13 or more years)	Mothers' Educational Attainment: Low (12 or less years)	
Student Reading Ability (Percentile Ranks)	High (69-99)	N = 69(61) Mean = 76.94 SD = 93.06 Range = 0-600	N = 39(34) Mean = 77.26 SD = 72.30 Range = 0-360	Mean = 77.06
	Middle (32-68)	N = 48(45) Mean = 69.21 SD = 76.95 Range = 0-420	N = 47(38) Mean = 69.17 SD = 95.82 Range = 0-555	Mean = 69.69
	Low (1-31)	N = 17(16) Mean = 118.06 SD = 95.14 Range = 0-300	N = 27(27) Mean = 141.15 SD = 143.35 Range 10-600	Mean = 132.23
		Mean = 79.39	Mean = 89.16	

( ) = Number of parents whose time is greater than zero

Findings

(a) Students' ability and parents' homework time. There is a tendency for parents to allocate more than the average amount of time for helping students of high and low ability with their homework. This finding is constant across parents' SES levels, although the greatest amount of time is provided, on average, to the low ability children of low SES parents. This curvilinear pattern is consistent with our discussion in which we postulated that parents would provide a greater than average amount of time to (i) high ability students who are most able to transform resources into learning and (ii) low ability students, who are most in need of additional help.

(b) Parents' SES and parents' homework time. There is a slight tendency, more noticeable among low ability students, for parents of relatively low SES to provide more time to students' homework than high SES parents.

(c) Parent-student interactions. According to Table 4-2, children of relatively low and relatively high ability spend more time on homework than do middle ability students. We conclude, then, that students' allocation of time is influenced by the values of both parents and teachers, who concentrate, especially in the assignment of homework, on the students of low and high ability levels.

B. Determinants of parents' time allocations to children's out-of-school lessons.

We turn, in Tables 5-3 and 5-4, to an analysis of the determinants of parents' time allocations for out-of-school lessons. While homework is partly intended, we assume, to support the efforts of t[illegible]hool, out-of-school lessons result, for the most part, in an expansio[illegible] the school's curriculum. We find, accordingly, that the patterns in Table 5-3 differ from those in 5-2.

Table 5-3

Parental Allocation of Time to Children's Out-of-School Lessons
(Minutes per week)

		Mothers' Educational Attainment		
		High (13 or more years)	Low (12 or less years)	
Student Reading Ability (Percentile Ranks)	High (69-99)	N = 67(35) Mean = 64.10 SD = 147.13 Range = 0-860	N = 38(20) Mean = 50.18 SD = 84.87 Range = 0-395	Mean = 59.07
	Middle (32-68)	N = 50(39) Mean = 56.50 SD = 66.54 Range = 0-280	N = 50(23) Mean = 29.36 SD = 49.74 Range = 0-180	Mean = 42.93
	Low (1-31)	N = 17(10) Mean = 62.94 SD = 87.47 Range = 0-270	N = 27(13) Mean = 36.70 SD = 76.65 Range = 0-360	Mean = 46.84
		Mean = 61.12	Mean = 37.97	

( ) = Number of parents whose time is greater than zero

(a) Students' ability and parents' time on lessons. The curvilinear relationship between ability and parents' time allocations remains, but is less pronounced than in the case of homework. Table 5-2 supports the proposition that, while low SES parents tend to concentrate their time allocations on low ability children for homework, they tend to favor their high ability children in providing time for lessons.

(b) Parents' SES and parents' time on lessons. Unlike the pattern for homework, parents' time on lessons is consistently higher for high SES than low SES parents. Hence, while low SES parents appear to concentrate on homework (which reinforces the efforts of the school), high SES parents concentrate (more than their low status counterparts) on lessons, which extend the school's efforts into other curricular areas.

(c) Parent-student comparisons. Tables 5-3 and 4-5 show some resemblance in patterns of parents' and children's time allocations to lessons. Except for high ability students there is a tendency for both high SES parents and their children to spend more time on lessons than those in the low SES category. There is a slight tendency for parents of high and low SES to favor their high and low ability students, while among students it is the middle ability children of high SES families and the high ability children of low SES families who spend most time on lessons.

In Table 5-4, we build on the analysis presented in Table 5-3 by displaying the relationships in a multiple regression format, in which the separate effect of each variable is determined, when the other variables are controlled. Also, in Table 5-4 we include, as well as mother's educational level and students' ability, three other independent variables, namely, parents' expenditure of money for children's out-of-school lessons, the number of siblings in the family, and the sex of the project students. We again

Table 5-4

Factors Related to Parental Allocation of Time
to Children's Out-of-School Lessons

Variables

Dependent Variable:

PARTIME: The number of minutes per week parents assist the project student with lessons.

Independent Variables:

EXPEND: Parental out-of-pocket expenditures per year on their children's out-of-school lessons.

MOMED: The number of years the project student's mother attended school.

RABILITY: The individual's percentile rank on a standardized test of reading comprehension.

NSIBS: The number of the project student's siblings.

SEX: Female = 2; Male = 1

Correlation Coefficients

	PARTIME	EXPEND	MOMED	RABILITY	NSIBS	SEX
PARTIME	1.0000					
	.0000					
	252					
EXPEND	0.2898	1.0000				
	.0001	.0000				
	252	253				
MOMED	0.1251	0.2501	1.0000			
	.0474	.0001	.0000			
	252	253	253			
RABILITY	0.0657	0.0886	0.2636	1.0000		
	.3022	.1627	.0001	.0000		
	249	250	250	250		
NSIBS	-0.0576	-0.1502	-0.1341	-0.1494	1.0000	
	.3625	.0168	.0330	.0181	.0000	
	252	253	253	250	253	
SEX	0.2274	0.1456	0.1286	0.1397	-0.0637	1.0000
	.0003	.0205	.0410	.0272	.3130	.0000
	252	253	253	250	253	253

Table 5-4, cont.

Regression Analysis

VARIABLE	STANDARDIZED B VALUE	PARAMETER ESTIMATE	STANDARD ERROR
INTERCEPT	0	0.09829	0.5300
EXPEND	0.3183	0.3389*	0.0632
MOMED	0.0587	0.0246	0.0257
RABILITY	-0.0369	-0.1461	0.2397
NSIBS	-0.0569	-0.0442	0.0460
SEX	0.2101	0.4469*	0.1269

R Square = .1659 F Ratio = 9.67
Prob > F = 0.0001

*indicates that the parameter estimate is at least twice the standard error

remind the reader that limitations imposed by the nature of the sample, especially owing to the non-randomness of the sample of project students, limits our ability to generalize from these results.

Findings

We report in Table 5-4 that two variables, namely, parents' expenditures of money for out-of-school lessons and the sex of the child both have significant relationship to the dependent variable, parents' allotments of time for out-of-school lessons. As we have shown in Table 5-3, students' ability does not have a consistent linear relationship with the dependent variable; mother's education, on the other hand, is significant in the correlation analysis but not in the regression because of the strong relationship between mother's education and parents' expenditures of money.

The Table also indicates that parents spend more time helping girls with lessons than they spend with boys. The probable explanation for this phenomenon is that girls at the age of those in the sample (12 and 13 year

olds) are more likely than boys to take lessons in such subjects as music, dance, and fine arts. Table 5-5 shows that this is, in fact, the case for the students in our sample.

Table 5-5

Child's Sex and Involvement in Lessons

Lesson S3

Frequency Expected # Percent Row Pct Col Pct	Sex Boys	Girls	Total
0 None	61 51.40 24.21 63.54 45.19	35 44.60 13.89 36.46 29.91	96 38.10
1 Some	74 83.60 29.37 47.44 54.81	82 72.40 32.54 52.56 70.09	156 61.90
Total	135 53.57	117 46.43	252 100.00

Statistics for 2-Way Tables

Chi-Square = 6.198 DF = 1 Prob = 0.0128

When we compare the actual frequencies with expected frequencies (the first and second number in each cell), we find that more boys than expected were involved in no out-of-school lessons and fewer than expected were involved in some lessons. Among girls, the opposite is the case;

fewer than expected were involved in no lessons and more than expected in some lessons. This differential participation explains why parents spend more time helping girls with lessons than they spend with boys.

(5) Determinants of Parents' Expenditures of Money for Children's Out-of-School Lessons

Within the home, parents combine their time in various proportions with the goods and services they purchase. For example, parents with relatively large incomes may substitute money for time by paying for their children to receive lessons outside the school and home. Other parents, unable to afford such lessons, may use more of their own time by participating with their children in homework, as well as hobbies, sports, and similar learning activities.

In the following pages, we report on the use of parents' financial resources for facilitating children's out-of-school learning. Table 5-6 which parallels Table 5-1, reports on the use of money by parents for children's out-of-school learning activities.

Table 5-6

Parental Out-of-Pocket Expenditures for Children's Out-of-School Learning Activities (Dollars per Year)

Activity	N	Mean	SD	Range
$ Lessons	250 (128)	106.07	171.78	0-830
$ Sports	250 (152)	101.66	241.96	0-2212
$ Hobbies	250 (139)	40.41	116.60	0-1600
$ Youth Organizations	249 (87)	15.02	39.68	0-415
Total Expenditures	250 (218)	157.03	321.32	0-3720

( ) = Number of parents whose expenditures are greater than zero

Table 5-6 indicates that, while many parents reported spending no money on the out-of-school learning activities of their fifth grade children, others reported substantial expenditures of money. We now report, in Tables 5-7 and 5-8, the relationships between mothers' educational level, students' reading ability, and parental expenditures for their children's home learning activities. We concentrate on the more academic kind of students' home activities, namely, out-of-school lessons, and the less academic activities, including sports hobbies and organizational activities.

Table 5-7

Parental Out-of-Pocket Expenditures for Children's Lessons
(Dollars per Year)

		Mothers' Educational Attainment		
		High (13 or more years)	Low (12 or less years)	
Student Reading Ability (Percentile Ranks)	High (69-99)	N = 69(37) Mean = 123.32 SD = 187.06 Range = 0-673	N = 38(19) Mean = 86.41 SD = 127.91 Range = 0-410	Mean = 110.0
	Middle (32-68)	N = 49(34) Mean = 175.86 SD = 210.68 Range = 0-830	N = 49(19) Mean = 59.14 SD = 131.43 Range = 0-715	Mean = 117.5
	Low (1-31)	N = 17(7) Mean = 100.71 SD = 189.18 Range = 0-662	N = 27(12) Mean = 52.30 SD = 116.58 Range = 0-500	Mean = 71.0
		Mean = 139.54	Mean = 66.78	

( ) = Number of parents whose expenditures are greater than zero

Findings

Table 5-7 helps us to develop a more complete picture of parents' use of resources than was available by examining only the manner in which parents used their time to promote students' learning.

(a) Dollars for lessons and students' ability. There is a strong tendency for parents' allocation of money for children's lessons to favor children of high and middle ability. In contrast, parents' allocation of time for children's homework favors children of relatively low ability. Hence, while home resources have an equalizing effect on the kinds of capabilities for which homework is intended, parents' use of resources for lessons (which serve the purpose of broadening children's learning experiences beyond the subjects taught in school) tend to favor children of relatively high levels of ability.

(b) Dollars for lessons and parental status. Parents of relatively high status, who are financially able to spend more than the average amount of money on their children's education spend more than twice as much, on the average than low status parents on making lessons available for their children. High SES parents also spend considerably more time for this purpose than low SES parents. On the other hand, low SES parents spend more time helping their children with homework than do high SES parents.

(c) This SES bias is also evident in students' allocation of their own time; high SES students spend more time on lessons than do children of relatively low SES.

In order to provide a broader perspective on parents' resource allocation for their children's education we examine, in Table 5-8, parents' allocation of money for such non-academic activities of children as sports, hobbies, and organizational activities.

Table 5-8

Parental Out-of-Pocket Expenditures for Children's Sports, Hobbies and Organizational Activities

(Dollars per Year)

		Mothers' Educational Attainment: High (More than 12 years)	Mothers' Educational Attainment: Low (12 or less years)	
Student Reading Ability (Percentile Ranks)	High (69-99)	N = 69(59) Mean = 210.83 SD = 260.56 Range = 0-1300	N = 39(36) Mean = 82.56 SD = 132.41 Range 0-818	Mean = 164.51
	Middle (32-68)	N = 49(44) Mean = 243.10 SD = 612.24 Range = 0-3720	N = 49(41) Mean = 103.80 SD = 136.37 Range = 0-676	Mean = 173.45
	Low (1-31)	N = 17(16) Mean = 130.88 SD = 135.82 Range = 0-434	N = 27(22) Mean = 83.96 SD = 91.18 Range = 0-240	Mean = 102.09
		Mean = 212.47	Mean = 91.94	

( ) = Number of parents whose expenditures are greater than zero

As in the case for out-of-school lessons, there is a strong SES effect on parents' allocation of money for non-academic activities; high MOMED parents spend considerably more money for this purpose than do families characterized by low MOMED. High SES families provide more money for the non-academic activities of children of middle and high ability, while low SES families tend to favor their middle ability children.

As we have done in the previous analyses, we now examine, in a multiple regression format, the predictors of parental expenditures for children's out-of-school lessons. Since parents' SES has been shown to affect their allocation of resources, we dichotomize the analysis by levels of MOMED.

Table 5-9

Factors Related to Parental Expenditures
for Lessons for the Sample
Dichotomized by Mother's Education

Variables

Dependent Variable:

EXPLESS: The dollars per year spent on the project student's lessons. Capital expenditures are not included.

Independent Variables:

PARTIME: The number of minutes per week the project student's parents spend driving to and from the lesson and assisting the student with related practice or study.

RABILITY: The student's percentile score on a standardized test of reading comprehension.

NSIBS: The number of siblings.

SEX Female = 2; Male = 1

Regression Analyses

	STANDARDIZED B VALUE	PARAMETER ESTIMATE	STANDARD ERROR
A. High MOMED (13 or more years)			
INTERCEPT	0	-0.2661	0.7544
PARTIME	0.5246	0.6321*	0.0904
RABILITY	0.1014	0.5047	0.3649
NSIBS	-0.0958	-0.1104	0.0852
SEX	0.0518	0.1326	0.1912
R Square = .3147		F Ratio = 14.81 Prob > F = 0.0001	
B. Low MOMED (12 or less years)			
INTERCEPT	0	0.6117	0.6117
PARTIME	0.5627	0.6247*	0.0890
RABILITY	0.0032	0.0136	0.3408
NSIBS	-0.1471	-0.1056	0.0564
SEX	-0.1950	-0.0451	0.1952
R Square = .3408		F Ratio = 14.22 Prob > F = 0.0001	

*indicates that the parameter estimate is at least twice its standard error.

Discussion

We had thought it possible that the sign for the "parents' time" variable would be different between the low and high SES families. However, in both cases, the coefficient is positive and significant; regardless of the mother's educational level, parents who spent more time helping their children with out-of-school lessons also spent more money for this purpose. The finding should not be surprising; it is likely that few if any members of our sample could afford to hire chauffeurs to take their children to, say, music lessons; for parents who could afford these lessons, both time and money were needed.

For the low SES families, the coefficient for the number of siblings approaches our designated level of significance. For these families, therefore, the more children in the family, the less money was spent for lessons on each child. This finding coincides with that in other research;[14] however, the differences for this variable between SES levels in our research is only slight, and the variable is only marginally significant.

We now turn to an entirely different form of parental investment in children's education, namely, the decisions of some parents to locate their place of residence in response to parental perceptions of the quality of school systems.

(6) How Parents Influence their Children's Schools

One possible source of error in studies of the effects of schooling in the United States is that many parents take school characteristics into account when deciding on their place of residence. The resulting matching of the characteristics of schools and students may result in statistical

findings of "school effects" which are, in reality, the result of parents' migration decisions.

This part of our research is influenced by the theoretical work of Tiebout, who postulated that families may base their decisions to settle in a given community on their perceptions of the public services provided in a given community and the taxes which are levied to support these services.[15] Wimpelberg applied Tiebout's theory to schooling, hypothesizing that high status families -- who can afford to locate where schools reputed to be of high quality are available, and who are able to obtain and interpret information about schools -- are more likely than low status families to take the characteristics of schools into consideration when deciding to move to or remain in a given community.[16] He found that sixty percent of households with low levels of mothers' education did not locate because of their knowledge about schools; middle education families are evenly split; but seventy-seven percent of high education parents chose their residence, at least in part, because of the characteristics of the public schools. Table 5-10 reports our analysis of the relationships between parents' use of information about schools and three independent variables -- mother's education, parents' expectations for their children's education, and students' ability.

Discussion

All three independent variables -- SES (as indexed by mother's educational level), parents' expectations for their children's education, and children's ability are correlated with parents' use of information about schools when making their location decisions. However, because the independent variables are interrelated, only one of them, parents' social status, appears as significant in the regression analysis. Mother's education, our

Table 5-10

The Influence of School Characteristics
on Parents' Location Decisions
(Second Year Data Only)

Variables

Dependent Variable:

INFO: A scale of 0-4 based on the amount of information regarding the schools parents reported to have when moving or deciding to stay in the community.

Independent Variables:

MOMED: The number of years of schooling completed by the project student's mother.

EDEXP: A scale of 1-5 based on the level of schooling project parents expect their child to complete.

PABILITY: The student's percentile rank on a standardized test of reading comprehension.

Correlation Coefficients

	INFO	MOMED	EDEXP	RABILITY
INFO	1.0000 .0000 153			
MOMED	0.2919 .0003 153	1.0000 .0000 153		
EDEXP	0.2496 .0019 153	0.3418 .0001 153	1.0000 .0000 153	
RABILITY	0.1305 .1114 150	0.3277 .0001 150	0.2758 .0006 150	1.0000 .0000 150

Regression Analysis

VARIABLE	STANDARDIZED B VALUE	PARAMETER ESTIMATE	STANDARD ERROR
INTERCEPT	0	-0.9456	0.5477
MOMED	0.2232	0.0821*	0.0311
EDEXP	0.1608	0.1045	0.0543
RABILITY	0.0581	0.2048	0.2881

R Square = .1142 F Ratio = 6.27
Prob > F = 0.0006

*indicates that the parameter estimate is at least twice its standard error

SES variable, is strongly related to family income, and families with relatively high incomes are more able than low income families to take schools into consideration when selecting their place of residence. In addition, well educated parents are able to obtain and interpret information about schools. Parents' expectations for their children's education is also a strong predictor of their location decisions. Children's ability is positively related to parents' decisions to base their location decisions on the characteristics of schooling. There is therefore an indication that, when parents make their location decisions, they are more likely to be influenced by the educational needs of high ability children than by their desire to find better schools for children of low ability.

While these findings do not indicate a lack of concern among low SES parents for their children's education, many low status parents are not able, for economic reasons, to seek out "good" schools for their children. However, the effect "at the margin" of social status on migration decisions of families, is to produce status linked differences among schools in students' home characteristics, parental status, educational aspirations, and students' ability (See Chapter 6).

We now conclude this Chapter with a summary of the findings and a discussion of their implications.

Table 5-11

Summary of Findings:
Parents' Allocation of Time and Money

TABLE	DEPENDENT VARIABLE	INDEPENDENT VARIABLES	FINDINGS
5-1	Parents' Time Allocations for Children's Activities (Univariate Statistics)		
5-2	Parents' Time Helping with Homework	Students' Ability, MOMED (a proxy for SES, socio-economic status)	In general, high SES parents spend less time than low SES parents helping children with homework. This difference is largely accounted for by variation in the amount of time spent with low ability students, who on average, receive the most help, regardless of SES.
5-3	Parents' Time Facilitating Lessons	Students' Ability, MOMED	High status parents spend more time on lessons than do low status parents. There is a curvilinear relationship between parents' time and students' ability, with middle ability students receiving, as was the case with homework, the least time.
5-4	Parents' Time Facilitating Lessons (Regression Analysis)	Expenditures for Lessons, MOMED, Students' Ability, Number of Siblings, Sex	Parents' Time is significantly related to both expenditures and the sex of the child.
5-5	Children's Involvement in Lessons	Sex	More girls than expected take lessons while fewer boys than expected take lessons.

Table 5-11, cont.

TABLE	DEPENDENT VARIABLE	INDEPENDENT VARIABLES	FINDINGS
5-6	Parental Expenditures for Children's Activities (Univariate Statistics)		
5-7	Parental Expenditures for Children's Lessons	Students' Ability, MOMED	High SES parents spend more money (as they do time) than low SES parents. When SES is high, there is a curvilinear relationship between expenditure and ability, with middle ability students receiving the greatest investment. When SES is low, expenditures are positively related to ability.
5-8	Parental Expenditures for Children's Sports, Hobbies, and Organizational Activities	Students' Ability, MOMED (SES)	High SES parents invest more money in these activities than do low SES parents, and middle ability children receive the greatest investments.
5-9	Parental Expenditures on Lessons (Regression Analyses for Sample Dichotomized by MOMED high and low)	Parents' Time Facilitating Lessons, Students' Ability	The best predictor of parental expenditures on lessons is parents' time allocation for this purpose.
5-10	The Influence of School Characteristics on Parents' Location Decisions	MOMED, Educational Expectations for the Child, Students' Ability	Mothers' education is a highly significant predictor of the amount of information parents obtained about schools before deciding whether to move or stay in a particular location.

Summary

Parents' socio economic status, as indexed by the level of the mothers' education, is a significant predictor of parents' allocation of resources for their children's education. Low SES parents (like their children) spend more time, on average, on children's homework than do parents of high social status. On the other hand, high SES parents spend more time and money on lessons and more money on non-academic activities than do parents of relatively low SES. Finally, high status parents were more likely than those of lower status to take schools' characteristics into account when deciding on a place of residence.

A substantial proportion of time spent on homework consists of completing assignments not finished in class or on exercises assigned by teachers. For the most part, therefore, homework is a reinforcement of lessons taught in school. On the other hand, out-of-school lessons tend to complement the schools' curriculum by adding activities such as foreign languages, music, and religious subjects. To a considerable degree, therefore, resources provided by low SES parents are used to help children meet performance standards set by teachers, while high SES parents use a substantial proportion of their resources to provide enrichment or, in other words, to supplement the schools' offerings.

The patterns of resource allocation among students of different ability levels are complex, and co-vary with both parents' SES and students' ability. In general, however, parents concentrate on high and low ability students in providing help with homework. In non-homework activities and especially non-academic activities, parents tend to concentrate their resources on students of the high and middle ability range. (a) There is

therefore a tendency, especially among low SES parents to partially concentrate their resources on their most able children, who are (by definition) the most productive learners. In this respect, parents help schools become more efficient. (b) Especially in the case of homework, parents also concentrate their investments on the least able children, thus helping them to compete with their highly able peers. (c) To partially compensate for this emphasis by schools and homes on the most and least able children, high SES parents concentrate their expenditures of money for non-homework activities on children of high and middle ability levels.

(7) Conclusions

Parents invest in their children's education in a variety of ways. They provide time and purchased resources for developing the capabilities of their pre-school children; these developed abilities influence the subsequent investment behavior of parents, schools, and the children themselves. After children enroll in school, parents continue to influence their behavior; at this stage in children's education, the interactions between schools and homes help to determine the effectiveness of both institutions. Finally, parents may compound their influence on children's education by selecting the schools their children attend, by affecting the decisions of school boards, or by interacting with teachers (See also Chapter 7).

From the standpoint of the school, parental resources provided for children's education are costless, although they are by no means costless to the parents themselves. Parents therefore influence the apparent efficiency of school systems, although this effect may vary among and within schools and school districts. Not only are children whose parents support

the schools' efforts likely to learn readily, but they may also be highly motivated and willing to devote their own time to learning at home and in school. The presence in an attendance area of interested parents may also make teachers' work less stressful, and may even influence teachers' decisions to locate in a given community.[17]

One of the more perplexing side effects of parental contributions to their children's schooling is that an equitable distribution of the school system's time and money may produce unequal results because of differences in parents' contributions of time and money. In order that we may understand the implications for equity of parents' involvement in their children's schooling we must examine the manner in which homes and schools respond to each other's efforts.

One type of school system response to unequal home resources is to provide special programs and additional resources for educating children from economically disadvantaged homes. Some parents respond in a similar fashion to preceived inadequacies in school programs by providing additional home resources to low achieving children. Thus, both homes and schools may attempt to compensate for a perceived deficiency in the resources the other institution provides. The opposite type of response, namely the provision of additional resources in homes and schools for the education of children with advantaged home backgrounds may also be observed (see Chapter 6).

Another aspect of the problem of inequality which is not measured by achievement test results is the tendency of homes and schools to provide high ability children with instruction in areas other than the basic skills. This phenomenon results from differences among parents in curricular preferences, from a desire not to "waste" the time of the most able students who

Footnotes to Chapter 5

[1]One of the first presentations of this interesting and important theoretical approach to education in the home is that of Becker (1965).

[2]Many of these studies are summarized in the presentations made at a conference sponsored by the National Bureau of Economic Research. The papers presented at that conference are included in a book edited by T. W. Schultz (1965).

[3]The theory is presented in Becker (1965).

[4]Two such studies, discussed in our Chapter 2, are those of Leibowitz (1974) and Hill and Stafford (1974).

[5]This point of view is expressed in the quotation on page 1 of this Chapter. Medrich (1982, p. 244).

[6]The idea that the quality or "value" of students' time is identical with students' capabilities is examined by Christoffersson (1971) as well as by Ben-Porath (1967).

[7]Ben-Porath (1967) emphasizes the dual role of students' time (as the product of previous investments and an input into future learning).

[8]An important statement of this relationship between the "value" of students' time and learning productivity was outlined by Carroll (1963). Carroll defined a student's aptitude as the amount of time a student needs to complete a learning task under optimal learning conditions. Aptitudes clearly differ among students and (for a given student) among subjects of the curriculum.

Footnotes to Chapter 5, cont.

[9]We report on the relationships between students' ability and the resource allocation decisions of students, parents, and teachers in Chapters 4, 5, and 6.

[10]For example, Bloom states that "it is likely that children with a larger vocabulary have considerable advantages over other children in learning to read as it is presently taught in schools." (1976, p. 45).

[11]Medrich, op. cit., p. 244.

[12]See, for example, Shneour (1974).

[13]For a useful study of the relationship between parents' social status and their investments in their children's education, see Hill and Stafford (1974).

[14]Hill and Stafford (1974).

[15]Tiebout (1956).

[16]Wimpelberg (1981).

[17]See, for example, Greenburg and McCall's study (1974) of migration within the San Diego City School System.

Chapter 6

DIVERSITY AND UNIFORMITY IN CLASSROOMS

> "... as we begin to focus on the ways of coping with...institutional demands, it should be recognized at once that adaptive strategies are idiosyncratic to individual students. We cannot predict, in other words, how any particular student will react to the constraints imposed on him in the classroom. We can only identify major adaptive styles that might be used to characterize large numbers of students." Jackson (1968, p. 17)

(1) Introduction

Two types of conditions which originate outside the classroom converge to affect the behavior of teachers and students. First, the fiscal decisions of states and school boards set limits on the purchased resources in classrooms. These constraints affect the instructional procedures available to teachers as well as the variety and quality of resources available to students. While the constraints imposed by available resources and performance demands may appear to affect students uniformly, differences in students' aptitudes and interests (resulting in part from their home environments) cause them to respond in diverse ways to the opportunities and constraints of their classrooms.[1]

We have already demonstrated, in Chapters 4 and 5, that there are differences in the resource allocation behavior of students and parents. We have also shown that out-of-school experiences affect the way in which students respond to the resources and demands of the classroom. In this Chapter, we will examine the effect of financial decision making on the classroom environment. We will examine some aspects of the manner in which money is transformed into goods and services and will describe the actual resources present in the classrooms of our study, the manner in

which these resources are combined with students' time, and the effects on students' classroom behavior of students' aptitudes and classroom resources.

While this Chapter describes the multi-level framework within which decisions affecting learning are made, its emphasis is on the classroom level, where the influences of children's homes and of macro level fiscal choices converge. Since fiscal decisions affect classroom resources, we begin with a brief examination of the fiscal foundations of the school districts in our study.

(2) Financing Public Schooling

The manner in which schools are financed sets limits on the resources available for classroom use, and therefore has an indirect effect on learning and teaching. Since there are substantial differences among states, school districts, and schools in the money available for public schooling, the services provided by public schools are unequal in both quantity and quality.[2] However, the linkage between financial resources and learning operates through a number of intermediate conditions, including how school districts spend the money at their disposal, how teachers combine students' time with purchased resources, and how the learning aptitudes and values which children develop at home and in the classroom affect their ability to profit from schooling.

Since funds for public schools are provided by state, federal and local governments and since each state has different laws concerning school finance, there are variations among and within states in the money available for schooling.[3] The central controversy in school finance, during the last decade, has been over the extent of the state's responsibility for reducing

the spending inequalities which result from the unequal property tax bases of local school systems. States but rarely succeeded in both equalizing expenditures and preserving the school districts' freedom to select programs and levels of expenditure which satisfy the varying demands of local communities.[4] The wealth and expenditure differences of the sample districts are not atypical of those found in most states.

Table 6-1

School District Characteristics
(N = 20)

	Per Pupil Expenditures	Equalized Assessment Per Pupil	Median Family Income	School District Size (ADA)
Highest	2,612	225,236	28,782	417,139
Lowest	1,391	24,193	8,999	277
Mean	1,978	64,425	14,766	22,788
Median	1,887	57,564	13,049	1,557
Standard Deviation	423	43,220	5,421	92,836
District 18 (Industrial Suburb)	2,604	225,236	8,999	277
District 6 (Major City)	2,465	30,740	10,242	417,139

Sources: Illinois Office of Education, "Variations in Expenditure per Pupil for Current Operations among Illinois School Districts, 1975-76." Also, National Center for Educational Statistics. 1970 Illinois Tape. Also, data supplied by schools.

The first statistic in Table 6-1, per pupil expenditure for education, represents the over-all constraint on decision making in these twenty school districts. Even in these suburban and urban school systems in a relatively

small part of a single state, the ratio of the highest to the lowest expenditure levels is an impressive two to one. The ratio of highest to lowest levels of taxable wealth is even greater, due to the fact that one district in the sample is an industrial suburb with a relatively large total property assessment and a small number of students. Median family income, our school district level SES variable, shows a ratio of over three to one. The ratio between size of the largest and smallest school districts is, again, very high, due to the inclusion of a large urban school system.

In the next table, we examine the determinants of the differences in district expenditures. Following James et al., as well as other researchers, we hypothesized that expenditure levels are influenced by the value of real property, the average socio-economic status of its residents and the size of the district.[5] Since all our districts are within a single state, differences in tax laws are not relevant.

We hypothesized that expenditure levels would be affected by property wealth (equalized assessed value per pupil) because this is the only important source of local revenue to which Illinois school districts have access. Our second hypothesis, that the average social status of school districts as indexed by median family income, would be directly related to their levels of expenditures for education was based on the premise that parents' social status affects the priority they give to their children's schooling.[6] Finally, we hypothesized that district size, as represented by average daily attendance, would be directly related to expenditure levels because salaries are generally higher in urban centers than other parts of a state, and because there is a tendency for more teachers to be at or near the top of their salary schedules in larger than in smaller districts. Again in Illinois, as in other states, there are provisions for providing additional funds to urban school districts.[7]

have mastered the competences required in skill subjects, and from social class-related differences among families in their ability to pay for enriched educational experiences. We will return to this issue of curricular differentiation in Chapter 7.

Table 6-2

Determinants of Educational Expenditures
(Sample of 20 School Districts)

Variables

Dependent Variable:
EXP: Per Pupil Expenditures Derived from State and Local Sources

Independent Variables:
EAV: Equalized Per Pupil Assessment
INC: Median Family Income
SIZE: Average Daily Attendance of the District

Correlation Coefficients

	EXP	EAV	INC	SIZE
EXP	1.0000			
EAV	.4843	1.000		
INC	.4330	-0.149	1.000	
SIZE	.2680	-0.188	-0.199	1.000

Regression Analysis

VARIABLE	STANDARDIZED B VALUES	PARAMETER ESTIMATE	STANDARD ERROR
INTERCEPT	0.0000	0.248	0.684
EAV	0.7276	0.299*	0.077
INC	0.4811	0.334*	0.117
SIZE	0.5004	0.071*	0.027

R Square = 0.569

F Ratio = 7.04
Prob > F = 0.0031

*indicates that the parameter estimate is at least twice its standard error

Note: It had seemed possible that the major urban school district in the study would not show the same relationship between the independent variables and per pupil expenditure as did the suburban school districts because state law provides a different process for this district to determine its tax rate for the support of schools than the process which is used in the suburban school districts. However, in an analysis of residuals, the district did not show up as an "outlier". That is, the expenditure level per pupil in the large urban district was not significantly different from the level which would be predicted on the basis of its assessed value, socio-economic status and size.

The results reported in Table 6-2 tend to confirm our hypotheses. Per pupil expenditures are, indeed, dependent upon the equalized assessed value of the school districts, their mean social status, and their size.

School District Allocation Decisions. We turn now to an examination of the systematic variation in the patterns of resource allocation of districts. We hypothesize that in high status school districts there may be less emphasis on the administrative and supervisory dimensions of education organizations and more on instructional activities, while districts populated mainly by blue collar workers may place greater emphasis on centralized control, thus requiring a larger proportion of supervisory and administrative personnel to total staff. There may be however some economies of scales in the employment of administrative personnel.[8]

The analysis presented in Table 6-3 shows a non-significant negative relationship between school district SES and the proportion of district employees holding supervisory and administrative positions. The correlation matrix also shows a (non-significant) negative relationship between district size and SES, reflecting the tendency of high status districts in our sample to be relatively small.[9] The only significant relationship is the negative one between district size and the ratio of administrative/support personnel, showing the presence of economies of scale in the employment of non-teaching personnel.

We turn now to another dimension of resource allocation within school districts, namely, the proportion of total expenditures which is allocated for teachers' salaries. There is a structural relationship between the level of teachers' salaries per pupil and (a) the over-all expenditure level of a school district, (b) the proportion of the district budget which is allotted to teachers' salaries as opposed to other instructional and non-instructional

Table 6-3

Determinants of School District Staffing Patterns
(Sample of 20 School Districts)

Variables

Dependent Variable:

SUPSTAFF: The ratio of the sum of the number of supervisory, consultative and central office administrative staff to the sum of the number of teachers and teachers' aides.

Independent Variables:

INC: Median Family Income.

SIZE: Average Daily Attendance.

Correlation Coefficients

	SUPSTAFF	INC	SIZE
SUPSTAFF	1.0000		
	.0000		
INC	-0.2923	1.0000	
	.2111	.0000	
SIZE	-0.2104	-0.1986	1.0000
	.3732	.4012	.0000

Regression Analysis

VARIABLE	STANDARDIZED B VALUE	PARAMETER ESTIMATE	STANDARD ERROR
INTERCEPT	0	0.6653	0.2954
INC	-0.3318	-0.1123	0.0685
SIZE	-0.5237	-0.0360*	0.0139

R Square = .3251 F Ratio = 4.10
Prob > F = .0353

*indicates that the parameter estimate is at least twice its standard error

salaries and material resources and (c) the ratio of students to teachers in a school district.

Our hypotheses for the prediction of teachers' salaries are as follows. First, since the property wealth of a school district is a measure of the amount of money a school district can afford to allocate for teachers' salaries, there should therefore be a positive correlation between equalized assessment and teachers' salaries. Secondly, since the mean socio-economic status is believed to be an index of the priority which adults assign to education, SES should be positively related to salary levels for teachers. Third, district size is positively related to salary levels since (a) wage levels are relatively high in large urban centers, and (b) many teachers in urban districts are near the maximum experience level of their salary schedules.

Table 6-4 indicates that, in our sample of school districts, there is a strong positive relationship between both property valuation and the average socio-economic status of adults in a school district and the level of classroom salaries per pupil. This relationship may partially reflect the fact that taxpayers' ability to pay for education depends on families' incomes as well as on the value of real property in a school district.

Needless to say, the expenditure patterns of school districts do not predict the resources that are available in any given classroom. These patterns do, however, provide clues about the overall opportunities and constraints in school districts, and therefore help clarify the relationship between school districts' social and economic characteristics and the educational environments provided for students.

Table 6-4

Determinants of Classroom Salaries Per Pupil
(Sample of 20 Districts)

Variables

Dependent Variable:
SAL: Classroom Teachers' Salaries Per Pupil, 1977-78.

Independent Variables:
EAV: Equalized Per Pupil Assessment, 1977-78.
INC: Median Family Income, 1970 Census.
SIZE: School District Average Daily Attendance, 1977-78.

Correlation Coefficients

	SAL	EAV	INC	SIZE
SAL	1.0000			
	.0000			
	20			
EAV	0.3249	1.0000		
	.1622	.0000		
	20	20		
INC	0.5419	-0.1480	1.0000	
	.0136	.5312	.0000	
	20	20	20	
SIZE	0.2554	-0.1883	-0.1986	1.0000
	.2771	.4266	.4012	.0000
	20	20	20	20

Regression Analysis

VARIABLE	STANDARDIZED B VALUE	PARAMETER ESTIMATE	STANDARD ERROR
INTERCEPT	0	-0.6076	0.5776
EAV	0.7369	0.3148*	0.0650
INC	0.5955	0.4298*	0.0985
SIZE	0.6497	0.0953*	0.0226

R Square = 0.7153 F Ratio = 13.40
Prob > F = 0.0001

*indicates that the parameter estimate is at least twice its standard error

(3) Stocks of Classroom Resources

We have already mentioned two kinds of classroom resources which are likely to affect behavior. These are, first, purchased resources, including the qualifications and capabilities of teachers, the amount and characteristics of available space and of books, furniture, and equipment, and second, students' ability and the amount of time they are willing to supply to learning.

Classroom resources serve several important purposes. Some, notably teachers but also books and films, serve as direct sources of information. Others, such as teaching techniques, programmed materials, and the use of space serve as devices for matching of curricula with purchased resources and with the time of students of different levels of ability. Still other classroom resources are used as incentives to encourage students and their parents to supply time (and, in the case of parents, money) for reinforcing and extending the work of the school. For example, teachers are sometimes provided with "free periods" to permit them to schedule and conduct conferences with parents.

In this section, we first present descriptive statistics for the classroom resources in our sample. These resources include: (a) teachers' characteristics; (b) students' characteristics; (c) spatial characteristics; and (d) books and workbooks. We then present a correlation matrix which indicates the relationship among these resources and between classroom resources and parental SES and student ability (both aggregated to the classroom level).

(a) Teachers' characteristics. The data in Table 6-5a show that the strong correlation between SES and teachers' salaries which manifested itself

Table 6-5

Teachers' Characteristics in a Sample of Fifth Grade Classrooms

A. Mathematics Classrooms (N = 30)

TEACHERS' CHARACTERISTICS	MEAN	STANDARD DEVIATION	LOWEST	HIGHEST
Estimated Per Pupil Salary	495.07	127.51	261	804
Number of Years of Experience	14.57	9.16	1	36

B. Social Studies Classrooms (N = 29)

TEACHERS' CHARACTERISTICS	MEAN	STANDARD DEVIATION	LOWEST	HIGHEST
Estimated Per Pupil Salary	479.17	99.52	336	744
Number of Years of Experience	14.38	8.25	3	36

Table 6-5a

Correlation of Teachers' Characteristics with Mean Classroom SES and Mean Classroom Achievement

A. Mathematics Classrooms (N = 30)

	MEAN SES	MEAN MATH SCORE
Estimated Per Pupil Salary	.07	.16
Number of Years of Experience	.02	.22

B. Social Studies Classrooms (N = 29)

	MEAN SES	MEAN READING SCORE
Estimated Per Pupil Salary	.10	.28
Number of Years of Experience	-.17	.23

at the school district level (Table 6-4) is not present at the classroom level. This is to be expected because, except in some large city school systems where experienced teachers are free to move to the privileged areas of the city, there is no basis for assuming a relationship between the SES of attendance areas and teachers' salaries. Students' test scores aggregated to the classroom level are only modestly correlated with teachers' salaries and experience; this finding is congruent with previous research which suggests that out-of-school variables explain a large proportion of the individual level performance of students.

(b) Characteristics of students. Students constitute an important classroom resource for several reasons. In the first place, the capabilities, interests, and motivations which children have developed through previous investments determine their learning productivity, thus affecting the efficiency of the educational system. Furthermore, as we demonstrated in Chapter 4, students' abilities influence their willingness to supply their time to further learning. Finally, the characteristics of students in a classroom influence their fellow students, since students learn directly from each other, and since students' abilities and motivations may be a form of incentive which affects the willingness of their peers to invest their own time in learning. We first present a profile of the characteristics of the students in our sample of classrooms (Table 6-6).

Table 6-6

Class Characteristics

A. Mathematics Classrooms (N = 30)

	MEAN	STANDARD DEVIATION	LOWEST CLASS MEAN	HIGHEST CLASS MEAN
Occupational Status of Class Parents (NORC Scale)	45.89	11.07	27.29	67.62
Class Percentile Rank on a Test of Mathematics Computation	55.10	16.54	17	87

B. Social Studies Classrooms (N = 29)

Occupational Status of Class Parents	46.07	9.86	32.69	67.13
Class Percentile Rank on a Test of Reading Comprehension	51.74	13.25	16	75

It can be seen from Table 6-6 that average parental status in both math and social studies classrooms varies from semi-skilled to highly skilled occupations. While the mean class rank on ability tests is at or near the 50th percentile (the national average), there is again a considerable range in class averages.

(c) Space. Spatial characteristics, like those of teachers and students, are assumed to have both a direct and an indirect effect on learning. For instance, it is commonly believed that the quality of a school building has a direct effect on learning. This, one may speculate, may be the rationale behind the decisions of the better financed school

districts to incorporate aesthetic considerations in plans for new buildings. We cite Getzel:

> Our visions of human nature find expression in the buildings we construct, and these constructions in turn do their silent yet irresistible work of telling us who we are and what we must do. Our habits impel our habitations and the habitations impel our lives. Winston Churchill's observation during the debate on rebuilding the House of Commons after the war holds for the common school as well: "We shape our buildings and afterwards our buildings shape us."[10]

This quotation draws to mind a classroom in our sample which included an alcove with a comfortable chair and a fireplace to which students were allowed to retreat with a book for quiet reading and contemplation. This, in our current utilitarian society, might be viewed as a frill which has no demonstrable effect on students' achievement levels. Without any supporting evidence we speculate that such "frills" may influence students' attitudes to school and to learning.

The second effect of classroom space is on the organization of students' and parents' time and other resources. Classrooms which by their nature facilitate and even encourage differentiated instruction may in turn influence teachers' allocatory decisions and hence affect students' behavior.

To illustrate the relationship between the use of classroom space and teachers' behavior, we present the example of two classrooms which vary widely in the amount of space which is available and in the manner in which that space is organized for instructional purposes. Figure 6-1 and Table 6-7 provide descriptive data on these classrooms.

CLASSROOM A

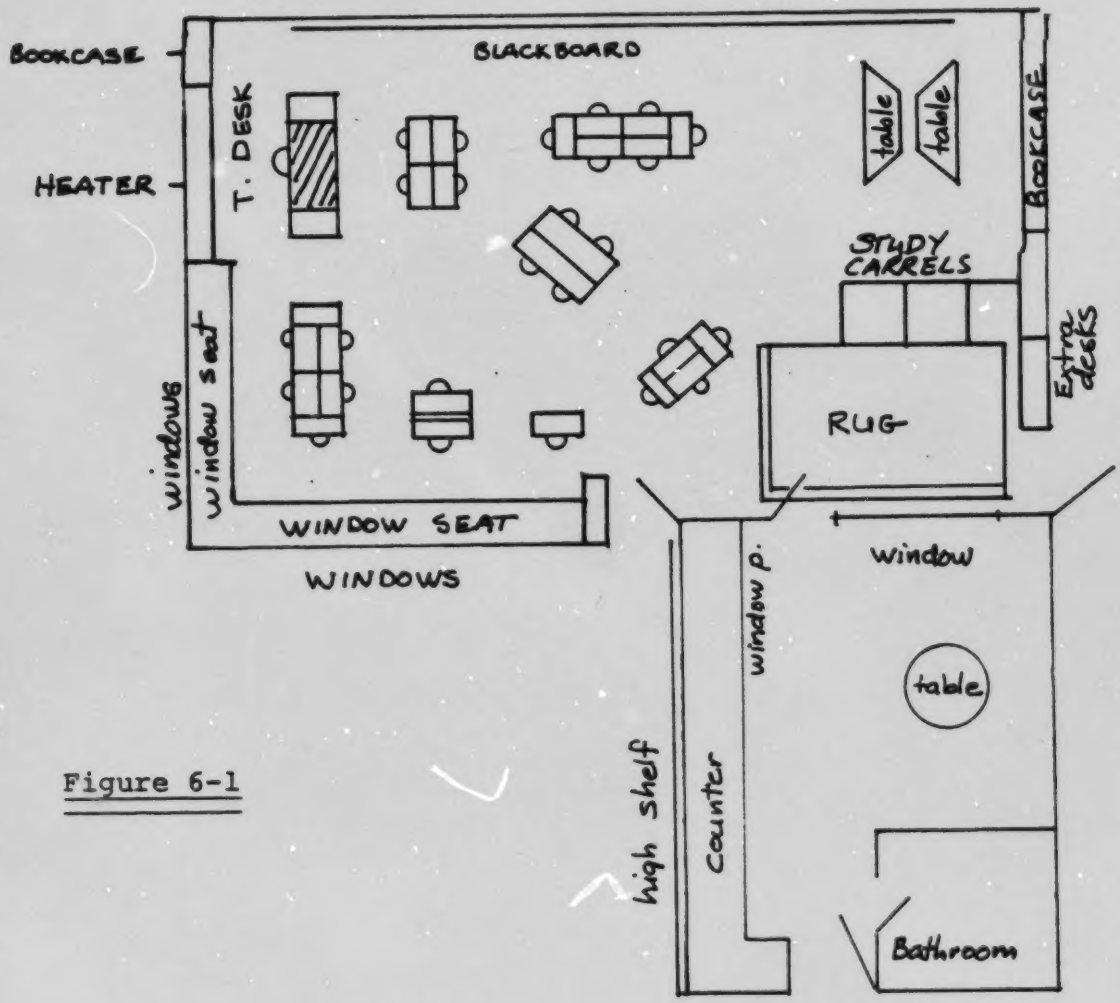

Figure 6-1

classroom B

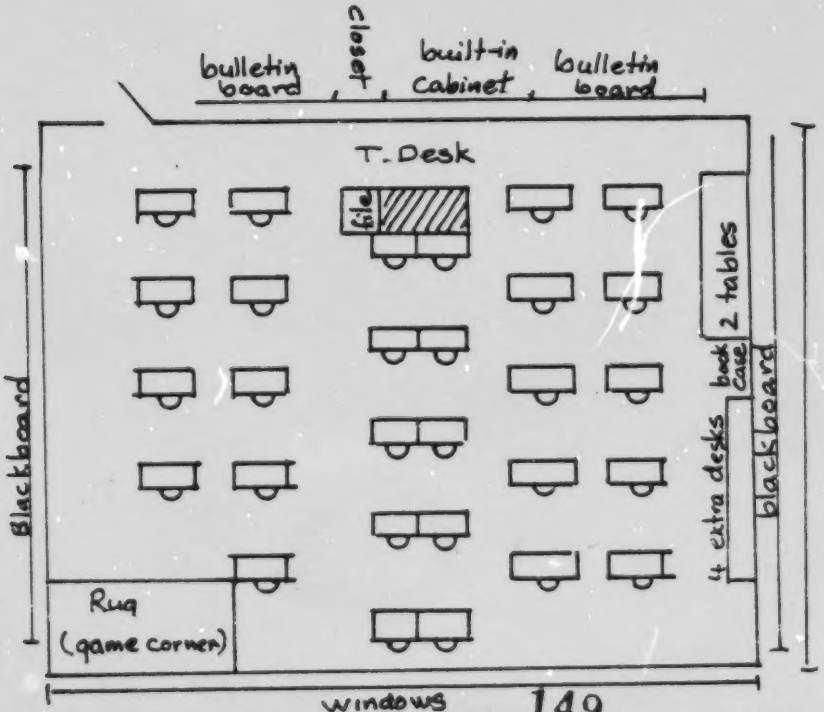

Table 6-7

Spatial Configurations in Two Classrooms

Classroom	Total Square Feet	Enrollment	Square Feet Per Pupil
A	1,145	32	36
B	725	29	25

Within the constraints imposed by the size and shape of the classrooms and the number of students in each, the two teachers arranged their furniture in a way which reflects their beliefs about how best to combine students' time with other resources. In the main part of classroom A, the rug provided a more intimate instructional situation than does a traditional arrangement of desks. The desks in the room are clustered to permit group activities, and study carrels make it possible for students to work individually. Also, the table and counters in the adjoining room permit some students to work on projects without disturbing others engaged in more formal learning activities. The following quotations from the interview with this teacher help to clarify her rationale for this arrangement.

> I wanted to maximize the size of the room to offer the most for everyone. I wanted it less structured in terms of the desk arrangements so I arranged the desks in groups. It's more informal this way and it gives the option of working with partners or in groups.
>
> I like having the rug in an area where I can pull kids up close and read to them.
>
> I'd really like to take my desk out entirely to release more room for the classroom.

In classroom B, on the other hand, the space available to the teacher is less conducive to differentiated instruction. The teacher in this classroom has less space per pupil at her disposal than the teacher in classroom A, and the rectangular shape of the room encourages the use of a traditional

arrangement of desks. Only one learning space is separated from the main body of the classroom; this is a "rug and game corner" which is used not for instruction but for games. The configuration of this classroom appears to be in keeping with this teacher's approach to instruction. While teacher A's desk is inconspicuously placed in a corner of the classroom, that of teacher B is in the center front of the room, permitting her to observe and supervise all students at the same time. She is concerned about her control over students' activities:

> I also find that the further children get from me physically the more they lose contact with me and think that I don't know what's going on.

In summary, while the amount and configuration of classroom space sets limits on teachers' allocatory decisions, the manner in which available space is organized and utilized reflects her beliefs and preferences.

(d) Books. Like space and teachers' time, the books and workbooks available in classrooms may serve several purposes. First, they may act as a source of direct information for students. Depending on the reading ability of students, and increasingly as students progress through school, books are more and more the source of the ideas, facts, and values which constitute the education of students. Secondly, the number, quality and type of books constitute a constraint on classroom organization. The presence or absence in a classroom of books on different topics and at different levels of reading difficulty may either permit or prevent adaptation of the curriculum to students' abilities and interests. Finally, a good supply of interesting reading material may act as an incentive for students to supplement teachers' instruction with their private studies. Descriptive data on the availability of books and the relationship of these resources to class average parental status and student ability are presented in Tables 6-8 and 6-9.

Table 6-8

Number of Separate Titles of Books and Workbooks
Related to Subject of Instruction
Which are Located in the Classroom
(Second and Third Year Data Only)

A. Mathematics Classrooms (N = 20)

	MEAN	STANDARD DEVIATION	LOWEST	HIGHEST
Number of Titles	6.6	10.93	1	38

B. Social Studies Classrooms (N = 19)

	MEAN	STANDARD DEVIATION	LOWEST	HIGHEST
Number of Titles	5.68	5.89	1	25

Note: The number of separate titles variables provides only a rough approximation of classroom stocks since classes may also draw on library resources. Also different schools vary in the way in which resources are divided among classrooms and the school library.

Table 6-9

Correlation of Number of Separate Titles
with Mean Classroom SES and Mean
Classroom Achievement
(Second and Third Year Data Only)

	MEAN SES	MEAN MATH SCORE	MEAN READING SCORE
Number of Titles - Math	.06	.30	---
Number of Titles - Social Studies	.46	---	.33

It can be seen from Tables 6-8 and 6-9 that although there are about the same number of separate titles of books and workbooks in mathematics and social studies classrooms, the correlation of books with mean classroom SES is much larger in social studies than mathematics. This difference probably reflects classroom procedures in the two subjects. In mathematics, the content of instruction was virtually identical in all classrooms included in the study. The fact that books are not available does not necessarily mean they should not be. In social studies, on the other hand, the content of instruction varied not only among but also within classrooms. Students, particularly in high SES classrooms, were sometimes permitted choice in research topics. In addition, it is interesting to note, however, that class average ability was not significantly related to the number of titles of books and workbooks in either subject.

By way of summary, we now present in Table 6-10 correlation matrices which show the relationships among the classroom level variables discussed in these sections. These variables consist of (a) stocks of purchased resources and (b) the classroom means of (i) parental social status and (ii) students' attainment in tests of arithmetic skills and reading comprehension.

The matrices in Table 6-10 have been partitioned to distinguish between two kinds of relationships, namely, (a) relationships among the resource variables and (b) those between the mean ability level and mean SES of students and the resource variables. The effects of this partitioning are of considerable interest. In mathematics classrooms, five out of six correlations among the resource variables are significant at at least the .1 level, while neither mean SES nor mean ability level is significantly related to any of the other variables. In social studies classrooms, four of five resource variables are significantly correlated with each other and

Table 6-10

Correlation Matrix of Classroom Level Variables

Variables

SALPER: Teacher's salary per pupil.

TEXP: Teacher's years of experience.

SQFT: The number of square feet per pupil in the classroom.

BOOKS: The number of different titles of books related to subject matter in the classroom.

CSES: The mean occupational status of the students' fathers in each class.

CMATH: The class mean percentile rank on a standardized test in mathematics.

CREAD: The class mean percentile rank on a standardized test in reading comprehension.

Correlation Coefficients

Mathematics Classrooms (N = 30)

	SALPER	TEXP	SQFT	BOOKS	CSES	CMATH
SALPER	1.0000					
TEXP	.3083*	1.0000				
SQFT[a]	.6295***	.4363*	1.0000			
BOOKS[a]	.3378	.7369***	.6769***	1.0000		
CSES	.0701	.1046	.2081	.0563	1.0000	
CMATH	.1615	.2231	.2353	.2998	.2556	1.0000

Social Studies Classrooms (N = 29)

	SALPER	TEXP	SQFT	BOOKS	CSES	CMATH
SALPER	1.0000					
TEXP	.3215*	1.0000				
SQFT[a]	.6677***	.2603	1.0000			
BOOKS[a]	.3627	.0537*	.7029***	1.0000		
CSES	.0996	-.1719	.3002	.4647*	1.0000	
CREAD	.2751	.2329	.4768**	.3335	.4970**	1.0000

[a]Data available for only second and third year classrooms. The number of cases are 20 for mathematics and 19 for social studies.

*p < .1 **p < .01 ***p < .001

(if we omit the relationship between SES and ability) only one of the student-related variables is associated with a resource variable (namely, reading ability with classroom space).

We interpret these results as follows. First, since classroom teachers' salaries per pupil are assumed to be closely associated with district expenditure levels, and since teachers' salaries are interrelated with the other resource variables, district level resources appear to have a pervasive influence on the availability of resources within the classrooms in our study.

Second, while district SES predicts district level expenditure (Table 6-2), classroom level SES is only significantly related to books in social studies classrooms. This may be due to the fact that both SES and specific resources vary among classrooms in a school district, so that relationships observed at the district level are not replicated in classrooms.

Third, while conventional wisdom links classroom resources to classroom achievement means, this linkage depends on the specific behaviors of teachers and students. We hypothesize that teachers do not distribute resources equally among their students, but rather that they adapt their classroom strategies to a variety of constraints including the curriculum, purchased resources, and subject-specific students' abilities. We test this hypothesis in the next section, in which we deal with the decision making behavior of classroom teachers.

Finally, any effect of classroom resources on students' performance must be mediated by the manner in which individual students respond to the opportunities and constraints of their classroom environment. We will therefore examine (in section 5) the effect of classroom characteristics on students' decisions to allocate their time to learning.

(4) Resource Allocation in Classrooms

Differences among and within classrooms in the nature of students' learning environments are strongly influenced by teachers. First, teachers may negotiate with their superordinates for resources. For example, a teacher may request tables rather than desks for students' work places; she may request a set of supplementary textbooks or a variety of teaching materials. In some schools, teachers are involved in the allocatory process itself, particularly in the assignment of teachers and students to classrooms.

Teachers may further influence students' environments by the way in which they combine students' time with their own time and other resources. These resource combinations, which we call "instructional technologies", include the way in which teachers organize their classes for instruction and their use of different resource combinations to teach the same (or different) subjects to different groups of students. For example, when a teacher has a discussion session with one group of students while another group is obtaining information from a textbook or workbook, two different technologies are in use.

In the next section we examine conditions under which teachers "differentiate" instruction by simultaneously using more than one instructional technology. In this section we concentrate on the definition and analysis of technological differentiation, as well as the conditions which cause teachers to use differentiated procedures in classrooms.

Determinants of instructional differentiation. The manner in which teachers combine the time of students with resources is influenced by a variety of conditions, including the nature of the curriculum, the definition of the teacher's role in a given school, the ability distribution in the class, the

availability of resources, and the preferences of parents. We examine these conditions separately.

(a) The effect of the curriculum. In Chapter 7, we will examine some characteristics of subject areas and their effect on instructional technology.[11] We also point out that the selection of the fifth grade as the focus for our research has an important effect on classroom technologies.

(b) Teachers' role in decision making. Teachers have the difficult task of mediating between the preferences and demands of the curriculum, their superordinates, colleagues, parents and students. Because of their complex responsibilities, it is not surprising that there are differences among schools in the manner in which the teacher's role is defined.

In her analysis of our data, Ferguson found that, in some schools, teachers participated in the assignment of teachers and students to classrooms, the determination of whether students should be homogeneously tracked among classrooms, and whether subject assignments to teachers should be departmentalized.[12] In other schools, teachers were treated as subordinates rather than as colleagues, since the school principals make these decisions with little or no consultation with teachers. In the principal-dominated schools, students tended to be assigned heterogeneously to classrooms; classroom size was roughly equal among classes; and instructional procedures were similar among classrooms. In schools where teachers participated in decision making, students were often tracked homogeneously, class size was smaller in low ability classrooms, and instructional procedures varied from classroom to classroom. Table 6-11 summarizes these findings.

Table 6-11

Grade Level Decision Making
(Second Year Data Only)

District Level Socioeconomic Status		
LOW	MIDDLE	HIGH
School 12 (P)	School 10 (P)	School 1 (T)
School 13 (P/T)	School 11 (P)	School 2 (T)
School 8 (P)	School 5 (P/T)	School 3 (T)
School 9 (P)	School 6 (P/T)	School 4 (T)
	School 7 (T)	

P = Principal made all decisions. T = Decision responsibility was delegated to teachers. P/T = Principal made tracking and departmentalization decisions, however teachers decided how to departmentalize classes among themselves. Source: Ferguson, 1983.

Since the data presented in Table 6-11 represent only a small number of schools and since they do not include all the schools in our sample, we are hesitant to draw firm generalizations from them. Furthermore, the lack of school level SES data forced us to use a district level variable to explain a school level effect.

(c) The ability distribution of students within classrooms. Like the curriculum, the characteristics of students in a given classroom influence both the ends and means of instruction. For example, if a classroom includes some students who are not at home with the English language, and if these students are not provided special instruction outside the regular classroom, teachers must modify their goals and procedures to take these limitations into consideration. Such modifications also affect the resources (including teachers' time) available for other students in the same classroom. Since all classrooms (at all grade levels) are characterized

by variations in student ability, these variations have an important constraining effect on teachers' use of purchased resources.

Because students' aptitudes are believed to be specific to subjects and topics of the curriculum, the content of the curriculum and differences in students' ability interact with each other to form the framework for teachers' resource allocation decisions. For example, variations in students' aptitudes for learning foreign languages may influence instructional technologies in the following ways. Some students make rapid progress in learning the vocabulary and grammar of a language and are soon ready for intensive practice in listening and learning, while others take more time to learn a linguistic structure. In this case, tape recorders and tapes permit the adaptation of instruction to individual differences. If these resources are not available, teachers may be forced to present uniform content at a uniform rate, resulting in a waste of time of the "fast learners" who are held back and the "slow learners" who are pushed beyond their capabilities. Similarly, a comprehensive library may permit social studies teachers to assign library research for some students while others receive direct instruction from the teacher. The absence of such a library may limit teachers' instructional alternatives, thus again resulting in a waste of students' time.

We hypothesize that, when a class includes a relatively large variation in students' ability, teachers will be more likely (than if the class is relatively homogeneous in ability) to use grouping and individualized instructional technologies which adapt the use of resources to variations in both curricular content and student-specific aptitudes. There is, of course, an alternate procedure for dealing at least in part with problems posed by differences in student ability. This is tracking or grouping of students

among classrooms according to their ability. About half the classes in our sample tracked students for mathematics (Table 6-12).

Table 6-12

Tracking in a Sample of Fifth Grade Mathematics Classrooms

PROCEDURE	N	MEAN CSES	STANDARD DEVIATION OF SCORES IN STANDARDIZED MATH SCORES
Non-tracked classrooms	16	44.37	3.95
Tracked classrooms	14	47.63	2.51

Definitions: Non-tracked classrooms -- students are distributed among math classrooms in a procedure which is not related to their ability in mathematics

Tracked classrooms -- students are assigned to math classrooms according to their ability in mathematics

CSES -- The mean occupational status of the fathers of the students in the class

Table 6-12 shows that there was a very slight tendency for tracking to be more common in classrooms of relatively high SES. Obviously, while tracking results in a reduction of the variance in students' aptitude levels, there are always differences in aptitudes (especially for specific skills) among students in a classroom. Thus tracking in and of itself is not expected to be a strong determinant of decisions to differentiate instructional technologies.

(d) Purchased resources. The resources allotted to a classroom may either facilitate or hinder teachers' decisions to differentiate classroom instruction. The amount and characteristics of classroom space, as well

as the number and variety of books and workbooks, and the furniture and equipment at the teacher's disposal all help to determine instructional options.

Within limits set by their own abilities and preferences, as well as the constraints imposed by hierarchical pressures, the content of the curriculum and the associated performance demands on students, teachers select classroom procedures designed to bring about specific curricular objectives. In making these choices, teachers may also be influenced by the preferences of parents.

(e) Parental influences. In a variety of ways, ranging from their choice of a place of residence to their involvement in school politics and informal meetings with teachers, parents influence the content and methods of instruction. Thus, classroom processes reflect, to differing degrees, the preferences of parents.

Sample parents were asked to report their preferences for whole class instruction, small group instruction, or individualized instruction. In his analysis of these data, Wimpelberg collapsed the latter two categories leaving the reported preference as between smaller than class size and class size instruction.[13] His independent variables included child's ability, as indexed by three levels of achievement on a standardized test of reading comprehension, and parental education, low (both parents have 12 years of schooling or less), middle (one or both parents have some post-secondary schooling, but neither has a four year college degree), and high (one or both parents have at least a four year college degree). Table 6-13 reports his analysis of the effects of parental SES and students' ability on parents' preferences for differentiated instruction.

Table 6-13

Child's Reading Ability and Parental Preferences for Instructional Grouping Controlling for Parents' Education (N = 145)

Child's Ability	Parents' Education: Low — Preferred Grouping Smaller	Larger	Total	Middle — Preferred Grouping Smaller	Larger	Total	High — Preferred Grouping Smaller	Larger	Total
Low									
No.	(5)	(5)	(10)	(9)	(6)	(15)	(3)	(1)	(4)
%	50.0	50.0	25.0	60.0	40.0	30.6	75.0	25.0	7.1
Grade Level									
No.	(6)	(13)	(19)	(12)	(11)	(23)	(12)	(13)	(25)
%	31.6	68.4	47.5	52.2	47.8	46.9	48.0	52.0	44.6
High									
No.	(7)	(4)	(11)	(9)	(2)	(11)	(22)	(5)	(27)
%	63.6	36.4	27.5	81.8	18.2	22.5	81.5	18.5	48.2
Total									
No.	(18)	(22)	(40)	(30)	(19)	(49)	(37)	(19)	(56)
%	45.0	55.0	100.0	61.2	38.8	100.0	66.1	33.9	100.0
	3.027 chi squares df = 2 prob. = .2201			2.768 chi squares df = 2 prob. = .2506			6.644 chi squares df = 2 prob. = .0361		

Overall Maximum Likelihood Chi Squares: 12.80 DF = 6 Probability = .05

Table 6-13 indicates that, for our sample of parents, those with middle and high levels of education prefer that their children be taught in small groups or on an individualized basis. Within these middle and high SES groups, parental preference for small group instruction is strongest where their children have either high or low levels of ability. These parents appear to recognize the importance of providing special help both for low achieving students and for children who are capable of either learning more rapidly or dealing with more advanced materials than are provided to the average child. Less educated parents tend to prefer small group instruction only of their children are above average in ability. This preference may reflect the likelihood that many parents with little formal schooling themselves are required to send their children to schools where the special needs of gifted children are either not recognized, or, if recognized, not attended to.

The Model. Our operational definition of instructional differentiation is the simultaneous provision of a number of different kinds of classroom activities. For example, a teacher may be working at the blackboard with a group of students who are having difficulties adding fractions, while the remainder of the class is solving problems from workbooks. Our basic unit of classroom observation is the "instructional segment" which is defined as a discrete activity, involving a specific group of students and a specific curricular topic, conducted over a given unit of time. Simultaneous segments are present when more than one instructional segment is observed during the same time frame.

Since the distribution of classrooms according to the percent of segments which were coded as "simultaneous" was bimodal, we decided to dichotomize the "differentiation" variable. Those classrooms in which at

least 40 percent of the segments were classified as "simultaneous" were termed "differentiated" and those in which fewer than 40 percent of the segments were so classified were categorized as "undifferentiated." Table 6-14 shows how this criterion divided the sample.

Table 6-14

Differentiated and Undifferentiated Mathematics Classrooms

PROPORTION OF ACTIVITIES	NUMBER OF CLASSROOMS	AVERAGE OF PERCENT OF ACTIVITIES CODED "SIMULTANEOUS"
More than 40 percent	15	.81
Less than 40 percent	15	.10

The statistical treatment consisted of discriminant function analysis, a procedure which is especially useful when the dependent variable is dichotomous rather than continuous. This method permits making a judgment about how well a set of independent variables predicts (separately and in combination) into which of the two categories of the dependent variable each case will fall.

The dependent variable in the analysis was whether or not a given mathematics classroom was "differentiated", that is, whether 40 percent or more of its activities are "simultaneous." The independent variables were the three contextual variables described in the previous section:

(i) Resource availability. While the availability of resources does not necessarily predict that differentiated instructional procedures will be used, the absence of resources poses serious constraints on teachers' decisions. The difference in resources between mathematics classrooms designated as differentiated and undifferentiated is clearly indicated in Table 6-15.

Table 6-15

Resources in Differentiated and Undifferentiated Mathematics Classrooms

Differentiated Classes

	N	MEAN	S.D.	RANGE
Teacher Experience	15	15.3	10.3	6-36
Separate Titles Texts/ Workbooks in Math[a]	11	9.4	14.3	0-38
Number of Sequential Learning Programs[a]	11	4.3	6.9	0-18

Undifferentiated Classes

	N	MEAN	S.D.	RANGE
Teacher Experience	15	13.9	8.2	1-29
Separate Titles Texts/ Workbooks in Math[a]	9	2.9	2.4	1-9
Number of Sequential Learning Programs[a]	9	.2	.4	0-1

[a]Data on these variables only available for second and third years.

By definition, the average learning group size is substantially smaller in the differentiated than undifferentiated classrooms. Descriptive statistics are provided for informative purposes. The difference in levels of teachers' experience is not sufficient to propose this as a causal variable. However, differentiated classrooms have considerably more textbooks, workbooks, and sequential learning programs than undifferentiated classrooms, suggesting that the absence of these materials would be a serious constraint on teachers' ability to introduce differentiated practices into their classroom.

(ii) Parents' preferences. Since we have already, in Table 6-13, demonstrated a relationship between parents' social class and their preference for small group instruction for their children, we introduce SES (as indexed by the classroom average of fathers' occupational status) as a hypothesized predictor of instructional differentiation.

(iii) Student Ability. We have argued that teachers may differentiate their classroom instructional practices in response to differences in their students' ability levels. We therefore postulated that instructional differentiation will be associated with the coefficient of variation* in students' mathematics test scores.

Table 6-16

Factors Influencing Teachers' Decisions to Utilize Differentiated or Undifferentiated Instructional Techniques in Mathematics

Variables

Dependent Variables:

DIFFERENTIATED CLASSES:	Classes with 40% or more instructional segments coded simultaneous.
UNDIFFERENTIATED CLASSES:	Classes with less than 40% of the instructional segments coded simultaneous.

Independent Variables:

SQFT:	The number of square feet per pupil in the classroom.
POPOCC:	The mean occupational status of the fathers of the students in the classroom.
CVMATH:	The coefficient of variation for the students' scores on a standardized test of mathematics.

---

*Note: The reason for using the coefficient of variation rather than the variance as a measure of dispersion is that this statistic is adjusted for differences in dispersion which result from variations in the classroom mean.

Table 6-16, cont.

Discriminant Analysis

MEANS

DISCRIMINATING VARIABLES	DIFFERENTIATED CLASSROOMS	UNDIFFERENTIATED CLASSROOMS	STANDARD DISCRIMINANT COEFFICIENTS
SQFT	46.453	33.820	-.692
POPOCC	50.487	41.293	-.697
CVMATH	4.779	4.671	not significant

Wilks' Lambda .706 Degrees of Freedom 2 1 28
Approx. F Statistic 5.619 Degrees of Freedom 2 27

Clarification of Results:

		PREDICTED GROUP MEMBERSHIP	
ACTUAL GROUP MEMBERSHIP	N	DIFFERENTIATED	UNDIFFERENTIATED
DIFFERENTIATED	15	10	5
UNDIFFERENTIATED	15	2	13

Discussion. Table 6-16 suggests that the decisions of teachers to differentiate their classrooms for instructional purposes originate in several sources.

First, decisions made by state government and local school districts result in differences among classrooms in the nature, quality, and quantity of purchased resources. These resources provide opportunities and constraints on teachers' decisions to adapt instructional technologies to differences in students' ability to deal with curricular demands. Since we regard teachers as semi-autonomous decision makers, we do not suggest that resources determine teachers' behavior. Rather, we propose that in the absence of adequate resources, teachers' options are limited, while the existence of a variety of

resources creates opportunities for teachers to deal creatively with the challenges which face them. While the resource variable included in Table 6-16 was classroom space, this is not the only variable which constrains teachers' choices. The presence of books, programmed materials, and (in the case of foreign language instruction) audio systems, all present obvious opportunities for teachers to adapt their procedures to differences in students' ability to deal with the curriculum. By no means the least of these facilitating resources are the capabilities and preferences of teachers themselves.

The preferences and political activities of parents constitute another kind of constraint and opportunity which influences teachers' behavior. The educational opportunities available to children in their homes affect their motivations and interests, and, indirectly, their ability to be self-directed learners. Parents' status has been shown to affect their educational investments, their exercise of influence on their children's schools, and their preferences for specific types of instructional technology. We regard the significant positive realtionship between mean SES of parents and the differentiation of classrooms as an indication that parental demands tend to influence educational practice.

Finally, the dispersion in students' ability is an indication of classroom pressures on teachers to differentiate their instructional procedures. This variable was not significant in our analysis, but must be regarded as having a potential influence on teachers' resource allocation decisions.[14]

We have, thus far, examined the availability of resources in classrooms, and teachers' decisions regarding the combination of resources with students' time. We have not yet, however, dealt with variations in students'

adaptations to these resources. We turn, in the next section, to the relationship between classroom resources, related variables and students' behavior.

(5) Classroom Resources and Individual Responses

Students of the educational processes have used a variety of approaches to describe and categorize the ways in which classroom activities affect students' behavior.[15] We have chosen to examine the manner in which various kinds of human and material resources are combined with the time of students, who themselves embody various types and levels of learning abilities. We have examined the antecedents of classroom resources, including the resource allocation behavior of parents and children as well as the decisions of higher authorities to raise and spend money for education and to assign specific resources to specific classrooms.

We have also examined the manner in which teachers, working within the constraints and opportunities available to them, develop a variety of resource configurations within which children learn. While our efforts have been preliminary and exploratory, we believe that they open the way to more exhaustive research which will replace the "black box" approach to the production of learning with an examination of the complex relationships in classrooms among resources and the decision making of teachers and students.

In this section, we examine students' response to their classroom environments. While students are believed to respond in an idiosyncratic fashion to environments, we seek for patterns, especially those which are related to other types of interrelationships discussed in the earlier part of the Report.

Since serious difficulties are encountered in drawing inferences across levels of data aggregation, and because children learn at home as well as in school, it is difficult to estimate effects of learning environments on the achievement of individual students. Instead, we use as our dependent variable students' decisions to invest their time in additional learning.

The independent variables are consistent with the theoretical approach discussed in previous Chapters, especially Chapters 3 and 4. They include:

(a) A measure of students' level of learning ability, in this case, their percentile ranks on tests in mathematics and reading. This variable reflects prior investments in students' learning capabilities, as well as their learning productivity, or ability to transform time into additional learning.

(b) The resources available to children in their homes, as indexed by parental SES and parental expectations for their children's schooling.

(c) A measure of students' out-of-school investments in learning, in this case the number of minutes per week each student devotes to recreational reading.

(d) A student-specific measure of the classroom resources allocated to each individual. This variable is indexed by the average size of the learning groups to which student "N" is assigned.

(e) Since we are interested in the effects of individual level variables on individual behavior, we remove the effect of the classroom as a whole by expressing each variable as the deviation of the individual observation from the classroom mean.

In Table 6-17, we present six regression equations which represent these individual level relationships in classrooms characterized by three levels of SES and by the two subjects we observed, namely, mathematics and social studies.

For the most part, the relationships reported in Table 6-17 confirm our hypotheses. However, there are some exceptions which underline the need for more studies of within classroom differences in students' response to available resources.

(a) In all six equations, students' ability is a significant predictor of involvement in classroom activities. This confirms our theory and is consistent with previously reported findings that students' level of capabilities are an important predictor of their willingness to invest time in learning, both at home and in school.

(b) In all equations, parents' values (as represented by their expectations for their children's educational futures) are significant predictors of students' involvement in classroom activities. However, parental status represented by fathers' occupational status is a significant predictor of students' involvement in only four of the six equations. We speculate that the two exceptions to this pattern may be due to the multicolinearity (relationship among independent variables) between parental status and students' ability.

(c) Students' home investments in learning, as represented by the time they devote to recreational reading, are also significant in only four out of six equations. Here again, multicolinearity may be a factor.

(d) Probably the most interesting finding of all is that the expected negative relationship between learning group size and student involvement is present in mathematics while an opposite relationship is present in social

Table 6-16

Factors Influencing Student Involvement in Mathematics and Social Studies
(Second and Third Year Data Only; Pooled Within Class Analysis)

Variables

Dependent Variable:

DPON: The proportion of the individuals' observations coded "on task" minus the mean involvement of the project students in the class.

Independent Variables:

DMABILITY: The individual's percentile rank on a standardized test of mathematics minus the class mean.

DRABILITY: The individual's percentile rank on a standardized test of reading comprehension minus the class mean.

DSIZE: The mean size of the individual's learning group weighted by the time spent in groups of a particular size minus the class mean. This is an indicator of resource flows to individual students.

DPOPOCC: The occupational status of the individual's father minus the class mean.

DEDEXP: Parental expectations for the level of schooling the individual will complete minus the mean expectations of the project students' parents in the class.

DRECREAD: The number of minutes per week the individual spends reading books outside of school minus the mean reading time of the project students in the class.

Regression Analysis

INDEPENDENT VARIABLE	ENTIRE SAMPLE		LOW SES CLASSROOMS (POPOCC $\leq$ 49)		HIGH SES CLASSROOMS (POPOCC $\geq$ 50)	
	Math	Social Studies	Math	Social Studies	Math	Social Studies
DMABILITY	.3391*	NA	.3712*	NA	.3372*	NA
DRABILITY	NA	.2272*	NA	.2076*	NA	.2241*
DSIZE	-.1115*	.0933*	-.0608*	.1035*	-.1972*	.1236*
DPOPOCC	.0091*	.0074*	.0437*	-.0439*	-.0392*	.0766*
DEDEXP	.0814*	.1298*	.0639*	.1194*	.1167*	.1513*
DRECREAD	.1602*	-.0328*	.0573*	.0539*	.2862*	-.1561*
R Square	0.2130	0.0929	0.1956	0.1053	0.2744	0.1092
F Ratio	7.63	2.93	4.23	2.31	3.63	.96
Prob > F	0.0001	0.0929	0.1956	0.1053	0.0073	.4560

*Signifies that the Beta weight is more than twice the estimate of its standard error.

studies. We can only speculate that this difference is due to the nature of the subject matter and the priority placed on it. Thus, in mathematics, an "important" and a well-focused subject in which the task and sequence is quite clear, assigning students to small groups may well increase their learning involvement. In social studies, on the other hand, which is apparently given less priority (see Chapter 7), lack of clarity in task definition or lack of cognitive content in the task (ex. cutting and pasting pictures of Presidents) may mean that small groups are less productive of involvement than full class lecture situations where teacher expectations are at least clear.

We might also note that, in the entire sample and for each SES group, the R-square and F ratio are greater in mathematics than in social studies. We take this finding as further support for our theory, which applies better to a structured subject in which both content and teaching methods were similar among classrooms than to a more diffuse curricular area, in which both content and instructional technologies varied widely across classrooms. Some of these differences are explored in greater depth in Chapter 7.

(6) Summary

Educational organizations utilize performance demands and purchased resources to create opportunities and constraints which, in turn, affect the behavior of teachers, parents, and students. However, because of differences in the values, resources, and aptitudes of individuals, each responds in a unique manner to the conditions which organizations create. We believe that understanding the effectiveness of public school systems requires an examination of both organizational constraints and individual responses.

Decisions affecting resource availability and educational practice are made at several levels, including those of the state, the school district, the school, and the classroom. However, since there is more variance (in important variables) within than among each of these units of organization, it is useful for policy analysts to consider the determinants of decision making at the organizational levels which are closest to the individual student. These levels include the student's home and classroom.

Equitable state and school district fiscal procedures create the necessary but not sufficient condition for equalizing opportunities at the classroom level. On the one hand, discrepancies in per pupil expenditures from one school district to another are responsible for differences in purchased resources among classrooms and therefore inequalities (from classroom to classroom) in the variables affecting the behavior of teachers and students. However, since many of the conditions affecting equity in educational opportunities originate in students' homes, equalization of expenditures among school districts will not, of necessity, produce a corresponding reduction in inter-district measures of student outcomes.

Since the availability of financial support at the school district level affects the supply of human and material resources in classrooms, it is useful to examine whether the determinants of resource availability are consistent across levels of the total system. We find, for example, that the average socio-economic status of residents of a school district is a significant predictor of expenditures per pupil, even when property valuation, the base of local tax systems for schools, is held constant. Also, at the district level, SES is positively related to teachers' salaries per pupil. These are useful findings, as we have already shown that the socio-economic status of families is positively related to parents' willingness

to supply time and money to their children's learning at home. There is therefore a tendency for children who are favored in their home environments to attend school in districts which are well financed and where teachers are well paid.

This relationship is not present at the classroom level where we show in Table 6-9 that the classroom SES level is virtually unrelated to either teachers' salary per pupil or teachers' experience. It is apparent that school district administrators do not assign teachers to classrooms (within school districts) so as to consistently favor classrooms containing either high or low status pupils. Nor is the classroom level relationship between teachers' characteristics and students' average performance levels significantly positive.

Within classrooms, however, the situation is different. There is a significant tendency for teachers assigned to high SES classrooms with an abundance of purchased resources to break their class into smaller groups or even to use individualized instruction, while teachers of lower SES classes who have fewer resources at their disposal tend to teach the whole class as a single group. Since differentiated instruction permits teachers to adapt the type and content of instruction to students' aptitudes and interest, relatively higher SES students may have superior access to purchased resources within classrooms.

We turn, finally, to a most interesting phenomenon, namely, the relationship between the organization (in this case, the classroom) and the individual. Our approach to this problem is to examine how students, with varying environments at home and at school, and with different levels and types of aptitude, respond to the resources provided in their classrooms. We find, first, that for the sample as a whole and for two SES levels, and

for both mathematics and social studies classrooms, students' ability is a strong predictor of involvement in classroom activities (See also Table 4-8). At home, the pattern for homework is different. Ability is a strong positive predictor of recreational reading and a strong negative predictor of time spent watching television.

Within classrooms, the effect of classroom resources on students' involvement differs systematically between mathematics and social studies. For the entire sample and for high and low SES classrooms, being taught in small groups tended to be positively associated with "time on task" in mathematics and negatively associated with the same variable in social studies. As indicated above, this difference may be due to the nature of the tasks. We now turn, in Chapter 7, to a discussion of the implications of the curriculum for resource allocation in education.

Footnotes to Chapter 6

[1]Jackson (1968, p. 17).

[2]These inequalities have been documented since the beginning of the Century. See, for example, Cubberley (1905) and James (1961, Chapter 1). Also Thomas (1968).

[3]Inequalities in educational finance are documented and discussed by Garms, Guthrie, and Pierce (1978).

[4]See James, op. cit. for a history of these conflicting goals of equity and freedom of choice.

[5]James et al. (1962).

[6]The relationship between social class and attitudes toward education has been explored by many social scientists. See, for example, Warner, Havighurst, and Loeb (1944).

[7]For a recent examination of the political and economic aspects of school finance in Illinois, see Langston (1979).

[8]For discussions of economies of scale in education see Cohn (1968). Also, Thomas (1977, pp. 34-37).

[9]Bidwell and Kasarda (1975) report on staffing patterns among school districts in Colorado.

[10]See Getzels (1974, p. 538).

[11]For a discussion of the relationship between subject area and instructional technology see Stodolsky (1981).

[12]Ferguson, Ph.D. research in progress.

[13]Wimpelberg (1981).

[14]Barr and Dreeben (in press).

[15]See, for example, Barr and Dreeben (1977, in press).

Chapter 7

RESOURCE ALLOCATION AND THE CURRICULUM

> "'But time's money, you forget that,' said the colonel. 'Time, indeed, that depends! Why, there's time one would give a month of for sixpence, and time you wouldn't give half an hour of for any money...'" (From Anna Karenina, by Leo Tolstoy.)[1]

Teachers, parents, and students "come alive" when teaching and learning their favorite subjects. They are inclined to devote their time to the activities they love best; students learn the subjects which interest them more readily than those they find unappealing.[2] Hence, the value of the time which all participants provide to children's schooling depends upon the particular curricular area which is at stake.

Musical parents, for example, may find that teaching their children to sing is pure delight for themselves and for their children as well. Parents who dislike mathematics, on the other hand, may regard helping their children with mathematics homework a tedious chore. For these and other reasons, curricular choice is an essential element in our discussion of how time and purchased resources are allocated in education.

While much of the literature dealing with the subject matter of instruction is normative, some research studies have dealt with the allocation of resources to various elements of the total curriculum. At the graduate school level, Friedman and Kuznetz examined the costs and benefits associated with investments in professional careers.[3] Several economists studied the rates of return to high school programs in vocational education.[4] There have also been studies of the costs of providing specific programs, such as vocational[5] and special education.[6] Since we do not attempt to measure the costs and benefits of specific subject areas, our work is not an economic

study of curriculum. We are interested instead in curricular preferences, technologies of instruction in specific subject areas, and the implications for educational finance of the joint provision of instruction by schools and homes.

(1) Elements of a Theory of Curricular Choice

Studies in the economics of education have, with several notable exceptions, paid little attention to the content of instruction at home and in school. Human capital is often regarded as having a single dimension, to be measured by such yardsticks as the years of schooling completed, scores on tests of achievement, or the costs of providing specific forms of education. Some of these measures are, of course, validated by their predictive value; for example, years of schooling is related to future income and test scores are good predictors of future success in school. However, both the cost and the benefits of education vary according to the content of the curriculum, and it is desirable that this dimension of human capital be included in our discussion. Since families as well as public agencies make judgments about the content of the curriculum, a partial basis for the following analysis is the distinction between the private and social benefits of schooling.

The existence of comprehensive systems of publicly financed and operated schools in the United States and elsewhere is evidence of a widespread belief that education produces important "social benefits" which are shared by all members of a society -- not merely those who are directly involved in providing or utilizing educational services.[7] Since even individuals and families who do not have children in public schools are assumed to benefit from public schooling, all are expected to share in paying taxes for the support of schools.

Perceptions of the importance of social benefits of education have resulted in policies whereby certain curricular goals are emphasized for all children. For example, the expectation that all students in public and private schools should be taught to read and write results from a consensus that a literate and informed electorate is a prerequisite for the success of democratic government. Similarly, the dependence of society on rapidly changing technologies provides an argument for improving the teaching of mathematics and science. Courses in civics, economics, and social studies are justified in turn by the importance of imparting an understanding of our political and economic system. Finally, establishment and expansion of vocational education in secondary schools were initially rationalized by the assumption of a direct relationship between economic growth and a trained labor force.[8]

However, even in the elementary grades, where the social benefits argument may be strongest, school boards manage to adapt their curricula to the private needs and demands of their clients. In high schools, special vocational and academic curricula are often intended to match instructional content with students' characteristics. At all levels, parents have their own sets of preferences, which may reflect their perceptions of their children's educational and vocational aptitudes as well as their own cultural, aesthetic, and academic values.

Within and among communities, families differ in the demands they place on their schools, as well as in the educational services they provide at home. However, since the educational preferences of families and the programs supplied by school systems do not always coincide, parental satisfaction varies with school offerings. Families with strong preferences are, of course, more likely than are those who are apathetic to be either very happy or unhappy with the school system.

Our research premits an examination of two aspects of curricular problems. First, we examine the implications for resource allocation of the "basic curriculum" which forms the core of educational programs in most public and private schools. We turn then to the relationships between parental preferences and what we call the "expanded curriculum" which includes subjects available in some school systems but not others, and which is often provided and financed directly by parents.

(2) Resource Allocation and the Basic Curriculum

Educational programs in a variety of curricular areas are supplied by schools and homes in response to demands expressed by governments, parents, and students. Studying how educational services are supplied involves identifying the curricula of schools and homes and examining the resource combinations which characterize instruction in each subject. To reduce the magnitude and complexity of the task, we included only the fifth grade, and only two subjects -- mathematics and social studies -- in our research.

Mathematics and Social Studies. During the progress of our study we observed classes in mathematics and (with the exception of one classroom in which social studies was not taught during the observation period) social studies. Mathematics is primarily a skill subject involving the mastery of hierarchically organized arithmetic processes. It is necessary, for example, to master subtraction and multiplication before gaining competence in long division. Since algorithmic skills are sequential and cumulative, teaching them demands a rational progression, which is often accompanied by periodic testing, diagnosis, and remediation.

Table 7-1

SOCIAL STUDIES TOPICS BY CLASS
(N = 28)

History	Geography	Society/ Culture	Economics	Current Events	Careers	Civics	Psychology
U.S. Colonial							
		Greek, Roman				U.S. Gov't.	
U.S., Illinois	U.S., Illinois			✓			
U.S.		Immigrants, Inventions, Unions					
	Map Skills		Costs of production & distribution, Supply & Demand				
		Baboon Troop, Chimpanzees, Eskimos, Incas					
U.S. Revolution	North Central States						
	Sumer, Greece	Ancient Civilizations					
		Mammals, Baboon Troop					
				✓		Purpose of rules	
Latin Amer.	Latin Amer.						
Latin Amer.	Latin Amer.						

Table 7-1, cont.

History	Geography	Society/ Culture	Economics	Current Events	Careers	Civics	Psychology
U.S. Colonial							
U.S. Colonial	U.S. Colonial						
		Industrialization			✓		
	U.S.	Aztecs/ Modern Amer.			✓		
U.S. Old West	Rocky Mtn.			✓		Communism	Moral Dilemmas
U.S. Civil War	U.S.			✓			
Pacific U.S.	Pacific U.S.	Inventions	Pacific natural resour., industry				
	Pacific U.S.						
		Israel					
Ancient(China)			Stocks	✓			
Settling New World(Simulation)		✓					
A. Lincoln	N.& S. Amer.						Family Problems
		Eskimos					
	Arctic Migration	Eskimos	Eskimo div. of labor, nat. resour.				
U.S. Colonial/ Civil War					✓		
	U.S.		Taxes, profit, supply-demand			Purposes of Fed., state, local govts.	

Source: Stodolsky, Susan S. "Classroom Activity Structures in Fifth Grade Classrooms." Final Report to N.I.E., Contract Number 400-77-20208 (in preparation). First year data added to original table.

In social studies, there is no single body of knowledge and skills which all fifth graders are expected to master. Our observations revealed, in fact, an astonishing diversity in content among classrooms. As Table 7-1 shows, curricular content, in social studies unlike mathematics, varied widely among sample classrooms.

One difference between the resource allocation patterns in mathematics and social studies classrooms lies in the use of time by teachers, parents, and students. In the classrooms included in our research, about ten percent more time was allotted, on the average, to instruction in mathematics than in social studies (Table 7-2). As Table 7-3 indicates, there was a disparity between the scheduled and actual use of time, suggesting that, in self-contained classrooms, there was a tendency for teachers to reallocate time from social studies to mathematics and possibly to other subjects. This finding is supported by the research of Berliner, who found wide variations among teachers in the amount of time they allotted to both subject areas and to specific sub-topics within subject areas.[9] One possible explanation for this finding is that teachers and students, who are held accountable for attaining specific performance standards in mathematics and language arts but not in social studies, tend to reallocate time from the latter subject to the former in an attempt to ensure that these standards are attained.

Table 7-2

Scheduled Time Allotments for Mathematics and Social Studies

(Minutes per Week)

	Mean	Maximum	Minimum	Standard Deviation
Mathematics	219	276	180	25.3
Social Studies	185	225	90	45.7

Table 7-3

Instructional Time Allotted to Mathematics and Social Studies

(Minutes per Week)

	Mean	Maximum	Minimum	Standard Deviation
Mathematics	201	274	143	36.4
Social Studies	167	276	72	46.8

Note: Classes with many "mixed segments" in which two or more subjects are taught simultaneously are not included in this analysis.

Although parents have little choice about whether social studies, mathematics, and the other basic subjects (such as English, science, and physical education) are included in their children's curricula and the amount of time devoted to each, they are able to reinforce the schools' efforts in particular areas through their own allocations of time and money. Students' priorities may also affect curricular emphases through the way in which they supply time to learning at home and in school. While there is a difference of less than twenty percent between the amount of classroom time scheduled for mathematics and social studies, students spent about fifty percent more time on mathematics homework than on homework in social studies. With parents the difference is even greater; they spent more than twice as much time helping students in mathematics as in social studies (Table 7-4).

Table 7-4

Time Spent at Mathematics and Social Studies Homework by Parents and Students

(Minutes per Week)

	Mean	Standard Deviation	Range
Parents' Time Allocated to Students' Mathematics Homework	32.06	44.12	0-275
Parents' Time Allocated to Students' Social Studies Homework	14.95	36.59	0-360
Students' Time Allocated to Students' Mathematics Homework	91.24	85.21	0-480
Students' Time Allocated to Students' Social Studies Homework	59.13	86.29	0-780

When we turn to children's allocation of time in the classroom, we find little difference between the mean level of students' involvement in mathematics and in social studies (Table 7-5). This finding is consistent with our other analyses of "time on task", in which explained variance is higher at the individual level than the classroom level.

Table 7-5

Students' Allocation of Classroom Time in Mathematics and Social Studies
(Percent of Classroom Observations coded as "On Task")

	Mean Student Involvement	
	Low SES	High SES
Mathematics	.78	.77
Social Studies	.75	.77

Since students' and teachers' time are the most important resources used in classrooms, the manner in which these resources are used is of great importance in tne selection of classroom "technologies".

Classroom Technologies in Mathematics and Social Studies. We define a "technology" as a specific combination of students' time with purchased resources which is intended to produce certain educational objectives. Our theory suggests that the value which teachers assign to students' time influences their selection of classroom technologies. If a high value is assigned to students' time, teachers may prefer procedures which permit each student to proceed at his or her own rate so that students do not waste time; if students' time is assigned a relatively low value, teachers may use whole class instruction which does not differentiate the rate and content of instruction according to students' abilities.[10] Table 7-6 provides descriptive data on the most frequently employed instructional technologies.

Table 7-6

Percent of Segments Characterized by Specific Technologies

	High SES Classrooms (Classroom Mean of POPOCC 50 or over)		Low SES Classrooms (Classroom Mean of POPOCC less than 50)	
	Math Classrooms	Soc. St. Classrooms	Math Classrooms	Soc. St. Classrooms
Individualized Seat Work	26	0	7	0
Group Work	1	43	0	22
Seat Work	23	18	32	19
Recitation	20	11	34	27

Note: Columns do not add to 100% since less commonly used technologies are omitted from Table 7-6.

The data in Table 7-6 suggest that preferences for specific technologies vary with both subject matter and SES. Teacher dominated activities such as recitation and supervised seatwork were observed more frequently in mathematics than in social studies and in lower rather than higher SES classrooms. In high SES mathematics classrooms seatwork was slightly more likely to be individualized than whole group while in high SES social studies group work was a dominant form of activity. Both individualized seatwork and group work are generally characterized by student rather than teacher pacing.

Plausible reasons for these findings were suggested earlier. First, fifth grade mathematics differs from social studies by reason of its emphasis on skill acquistion and practice rather than on the use of already acquired skills to obtain and process information. The algorithmic nature of skill building at this level suggests the need for intensive monitoring and feedback. In contrast, the very term "social studies" connotes a broad array of social science disciplines. Since, at this level, it tends to be an information gathering rather than a basic skill subject, the goals are not dictated by the content. Our observations of social studies suggest that neither goals or processes are as clearly formulated as they are in mathematics. While it is tempting to assume the presence of affective goals in the absence of cognitive ones, there is only weak evidence in the data of such a substitution.

The socioeconomic differences in the choice of technology suggest that, regardless of subject matter, students in relatively high SES classrooms were given more responsibility for pacing their work and, in some cases, choosing their tasks than were their peers in lower SES classes. The classroom observations themselves point to more profound SES related differences in classroom milieu. In low SES classes, for instance, students

were generally expected to sit in rows, work on the same task during the same period of time, passively await and follow instructions. Most acceptable peer communication tended to be mediated through the teacher. On the other end of the SES continuum, students were freer to move around, communicate in a task related manner directly with peers, and even, on occasion, to take "breaks". While it is easy to over-interpret these differences, students in different neighborhoods do seem to be given incentives to behave in ways rewarded in their parents' workplace.

Technological differences, however, are assumed to be affected not only by subject matter and social class preferences but also by the availability of resources. In the next section we discuss and provide data related to this relationship.

Classroom Resources and Technology. Table 7-7 reports zero order correlations between resource measures (including students' abilities in mathematics and reading) and an indicator of classroom technology, namely, the average size of learning groups.[11]

Since the objectives of mathematics instruction appeared from our observations of classroom practices to be relatively constant across the classrooms in the study, we anticipated a close relationship, in mathematics, between the availability of resources and the dominant technologies of instruction. We assumed that, unless constrained by a shortage of resources, teachers would organize their classrooms in order to take differences in students' capabilities and learning styles into consideration. We therefore hypothesized that there would be a negative relationship between the availability of resources and the size of the learning group.

In social studies instruction, on the other hand, instructional content and objectives appeared to vary from classroom to classroom (Table 7-1).

Table 7-7

Correlation Between Classroom Resource Stocks and the Technology of Instruction

(Second and Third Year Data Only)

Variables

Dependent Variable

LGS — Learning Group Size

Independent Variables

TEACHER'S EXPERIENCE: The number of years the teacher has taught.

BOOKS: The number of different titles of books and workbooks, related to the subject in the classroom.

SQUARE FEET PER PUPIL: The number of square feet per pupil in the classroom.

CLASS SES: The mean occupational status of the fathers of the students in the class.

CLASS ABILITY:

MATH: The class mean percentile rank on a test of mathematics.

READING: The class mean percentile rank on a test of reading comprehension.

CV:

MATH: The coefficient of variation (mean divided by standard deviation) for class results on a standardized test of mathematics.

READING: The coefficient of variation for the class results on a standardized test of reading comprehension.

Correlation Coefficients

Resource Variables	Learning Group Size: Math	Learning Group Size: Soc. Studies
Teacher's Experience	-0.5270*	-0.0097
Books	-0.4558*	-0.3718
Square Feet per Pupil	-0.5879*	-0.4918*
Class SES	-0.0331	0.2575
Classroom Mean Ability: (1) Math	0.2601	----
(2) Reading	----	0.0801
CV: (1) Math	0.1437	----
(2) Reading	----	-0.1170

*indicates that the probability of the association of the two variables occurring by chance = .05 or less

Since there is no uniformity in content or objectives and since the structure of the subject does not, for the most part, demand sequential instruction, we hypothesized that the technology of social studies instruction would be less dependent on resources than was the case with math.

The correlations in Table 7-7 show a significant negative correlation between all three measures of resource availability in mathematics and learning group size, supporting our hypothesis that, when resources permit, teachers tend to use differentiated instruction in mathematics classrooms. In social studies, on the other hand, only the availability of space predicts the tendency for teachers to work with students in smaller than classroom groups.

We turn now to another dimension of children's curricula, namely, subjects such as music, art, and foreign languages which are taught in some homes and schools but not in others. We have labeled these subjects the "extended curriculum".

(3) Parental Preferences and the Extended Curriculum

Because of differences in the private and public preferences for schooling, disparities may arise between the curricula which are prescribed by educational agencies and the curriculum of the home. One way the disparities between public and private preferences is reduced, in our system of government, is by the freedom of local school systems to adapt their curricula to the demands of their clients. In addition, families whose preferences do not correspond to the offerings of their children's schools may, if their economic situation permits, either move to a new community or send the children to a nonpublic school where there is a better fit between their

preferences and the schools' curricula. A third way of adapting curricula to parents' preferences is the procedure, in high schools and colleges, of offering a variety of optional tracks, subject options, and advanced and remedial courses for students of high and low ability levels. Another mechanism for reducing the disparity between curricula and parental preferences is the "home curriculum" which reflects parents' use of time and money to provide educational services which either strengthen or extend the services which schools provide to their children.

In the analysis which follows we define a curricular preference function as a combination of weighted curricular elements and the resulting allocation of resources of time and money across subject areas. Consider, for example, the case of two families, A and B, and four curricular elements, X, Y, Z, and W. The preference function of the two families may take the following form:

A's Preference Function: $.3X + .4Y + .3Z$

B's Preference Function: $.3X + .3Y + .2Z + .2W$

If X, Y, Z, and W represent, say, reading, mathematics, history, and music, family B places a little less emphasis than A on mathematics and history, but includes music in its mix of desired outcomes.

It is assumed that families such as B attempt to implement their unique sets of values by the way in which they allocate resources in the home, and by influence they exercise over the schools their children attend. In both cases, using resources for one type of curricular outcome results in fewer resources being available for the other subjects.

Curriculum construction therefore involves a large number of decisions, each of which involves trading off resources among the various goals and objectives of educational systems. The nature of these trade-offs

reflects the preference functions of parents, students and educators. Preference functions may be assumed to vary among families and, sometimes, among siblings within families.

Where the curricula of educational systems are at variance with parents' preferences, schools may be considered to be inefficient, since many parents consider that their money is not well spent. Hence, one way of increasing efficiency in education is to provide parents and students with a range of choice in both curricula and teaching methods. Another approach to improving efficiency is to select effective technologies and to develop a well motivated body of teachers and students. A third method commonly used to enhance efficiency in education is to use a single set of resources to make possible the simultaneous attainment of more than one goal. This approach, described by economists as "jointness in production", is exemplified by situations where instruction in reading and social studies is provided simultaneously or where students are taught in groups rather than individually. Some issues involved in the joint production of educational outcomes are discussed in Appendix C. We turn now to a discussion of parents' curricular preferences.

The determinants of curricular preferences. This sub-section reports the results of an empirical study of the variables which predict families' preferences among broad areas of their children's school curricula. A particular aspect of curricular preferences, namely, the issue of curricular breadth, is used as the basis for the analysis. A preference for curricular breadth is defined as a desire of parents that their children's curricula include not only the so-called basic and skill subjects, but also a variety of other subjects which have merit because of their aesthetic and cultural content.[12] This issue has received considerable attention in some communities

because of fiscal stringencies and because of allegations that, since resources are being devoted to the so-called frills, many children are not mastering the basic skill subjects of mathematics and reading.

In our attempt to identify the correlates of parents' curricular preferences, we included the following item in the parents' interview.

19. The elementary school curriculum for the 5th grade usually includes subjects like language arts (reading, writing, spelling), mathematics, social studies, and science. Some schools add other subjects.

(Give respondent hand-out.)

(A) Here's a list of subjects. Should any of these be included in N_____'s program in the 5th grade:

(i.e., should any be included whether or not they already are?)

RECORD CHOICES ON THIS PAGE
(circle respondent's choice for each subject)

vocal music	strong yes!	mild yes	neutral	mild no	strong no!
instrumental music	strong yes!	mild yes	neutral	mild no	strong no!
art	strong yes!	mild yes	neutral	mild no	strong no!
foreign languages	strong yes!	mild yes	neutral	mild no	strong no!

It is hypothesized that parents' preferences for a relatively broad curriculum are related to their own educational level, their expectations with respect to their children's educational attainment, and the ability of their children. Each of these relationships is now discussed.

(a) It is assumed that parents who have completed a relatively high level of education will be more likely than their less-educated counterparts to value a broad or "enriched" curriculum for their children. First, better educated parents are assumed to be aware of the cultural value of courses such as art, music and foreign languages. Second, the education of parents

is highly correlated with their income. High income parents can afford to provide an enriched curriculum for their children through their home investments, and through their access to public or private schools which satisfy their preferences.

(b) We assume that parents with high levels of expectations for the amount of schooling their children will complete are more inclined than those with lower expectations to prefer a broad curriculum for their children.

(c) Students' ability, like family income, is an indicator of families' abilities to invest profitably in education. Since the more able students can attain the required level of performance in the "basic subjects" with a relatively modest investment of their own time, they have "additional" time to spend on subjects like music, art, and foreign languages.

Table 7-8 suggests that, within the schools included in the study, families with relatively high socio-economic status (as indexed by mothers' education) and parents who assign a relatively high priority to their children's educational attainment are inclined to prefer an enriched curriculum, which includes such subjects as vocal and instrumental music, art, and foreign languages, for their children. While children's ability is positively related to both predictors of parental preferences, it is not in itself a significant predictor of parental preferences for an enriched curriculum.

The comments of parents provided some elaboration of the statistical analysis. The influence of social class on expectations was partly expressed in terms of financial constraints on curricular choice. For example, several parents said that the cost of a musical instrument was a major constraint on their children's study of instrumental music in school. Parental expectations

Table 7-8

Parental Preferences for an Enriched Curriculum
(Second Year Data Only;
Pooled Within Classroom Analysis)

Variables

Dependent Variable:

DENRICH: Individual Project Parents' rating on a scale based on preferences for an enriched curricula minus the mean of the project parents in the class. (Strong yes rated 4, mild yes 3, neutral 2, mild no 1, strong no 0).

Independent Variables:

DMOMED: The number of years of schooling completed by the project student's mother minus the mean of the project mothers in the class.

DEDEXP: The project parents' expectation of the level of schooling their child will complete minus the mean expectation of the project parents in the class.

DRABILITY: The project student's percentile rank on a standardized test of reading comprehension minus the class mean.

Correlation Coefficients

	DENRICH	DMOMED	DEDEXP	DRABILITY
DENRICH	1.0000			
	.0000			
	153			
DMOMED	0.2452	1.0000		
	.0023	.0000		
	153	153		
DEDEXP	0.2508	0.2503	1.0000	
	.0018	.0018	.0000	
	153	153	153	
DRABILITY	0.0737	0.2467	0.2584	1.0000
	.3698	.0023	.0014	.0000
	150	150	150	150

Regression Analysis

VARIABLE	STANDARDIZED B VALUE	PARAMETER ESTIMATE	STANDARD ERROR
DMOMED	0.1941	0.2267*	0.0962
DEDEXP	0.2122	0.3735*	0.1455
DRABILITY	-0.0281	-0.0029	0.0085

R Square = .0981 F Ratio = 5.33
Prob > F = 0.0018

* indicates that the parameter estimate is at least twice the standard error

for their children's education also entered into the responses. One parent said that

> (N) will never need it (a foreign language). It may be Okay for those who will go to college.

Others spoke of the limitations imposed by students' ability and the availability of time. One stated:

> Too much has to be taught in the shortened (school)day anyway so there would be no time (for foreign language instruction) and anyway (N) should get more out of English first.

(4) Implications for Resource Allocation

In this final section of Chapter 7, we examine the relationships between curricular choice and the major theme of this discourse, namely, the allocation of resources by teachers, parents, students, and school boards.

The issue of curricular choice in education is important because elements of the curriculum require different kinds and amounts of resources. For example, physical education programs require a gymnasium; mathematics instruction requires the services of (relatively scarce) mathematicians; and teachers of foreign languages often use elaborate audio taping equipment. The priorities assigned to curricular elements therefore affect the total cost of an educational program, and the types of inputs which need to be purchased.

We have assumed that curricular priorities are determined by both government agencies (which are responsible for ensuring that the social benefits of schooling are obtained) and individual families, who influence children's learning at home and at school. The relative influence of these agencies is, in part, a function of the interplay between the public and private goals of schooling.

This distinction between the public and private goals of education is, or course, an over-simplification. Thus, while the formal curriculum of public schools reflect society's investments in its own future well-being, there are also private benefits associated with the learning of mathematics, science, English, physical education, and the other elements of the fifth grade curriculum. Similarly, while instruction in music is often regarded as the responsibility of families, many people believe that public school programs in the arts are essential for the survival of a humanistic society.

Changes in curricular priorities often reflect national and international events. For example, the launching of Sputnik in the 1950's provided the impetus needed to encourage Congress to pass the National Defense Education Act, which provided large sums of money for upgrading instruction in mathematics, science, and foreign languages.[13] Structural changes in the American economy, together with a shortage of trained mathematics and science teachers, are creating pressures for similar emphases in the 1980's. Whether these shifting priorities will lead to the relative neglect of public school programs in the arts and humanities may well be a source of concern for many parents, students and teachers, and other members of the general public.

A second, frequently overlooked aspect of the relationship between resource allocation and the curriculum consists of the specialization of instructional technologies by subject area. Our colleague, Susan Stodolsky, has demonstrated that there are variations among subject areas in standard classroom practice.[14] These differences in turn, produce different demands for resources. For example, instruction in some subjects (like automobile mechanics) is capital intensive. Other curriculum-based differences in

classroom technology are more subtle. One result of recent advances in computer based instruction may be to focus attention on how best to combine teachers' and students' time with other inputs in teaching various school subjects and topics. One encouraging aspect of the computer "revolution" is that, unlike previous innovations such as "teaching machines," computers are seldom regarded as a panacea for the ills of education. Rather they are viewed as the basis for technologies which may be applied selectively, with due regard to both students' aptitudes and the content of instruction.

Equity and the Curriculum. We turn, finally, to the relationship between curricular choice and the distribution of the benefits of education.

Inequalities in children's opportunities that result from the relationship between their parents' status and the curricula of homes and schools are often overlooked by policy makers, who are under pressure to reduce the variance in achievement test scores. Since children learn at different rates, and since their home curricula vary, adapting the content of children's education to their aptitudes and interests may be desirable and even necessary. The curricular dimension of equality of educational opportunity may therefore include, as a minimum, (a) requiring all students to attain minimum performance standards in the basic skills, and (b) providing children with an opportunity to develop their specific talents, regardless of the wealth and social status of their parents.

Another aspect of curricular equity is related to the implied goals and outcomes of education.[15] Ongoing research by Ferguson[16] and Lortie[17] suggest that there are important school level influences on learning which vary in accordance with the dominant social class of the school; our research suggests that these school level influences are replicated in the classroom.

Briefly, these studies suggest that upper SES students attend schools and classrooms in which organizational procedures are adapted to the preferences of teachers and students. In schools and classrooms for working class students, on the other hand, power is concentrated to a greater degree in the school principalship at the school level and in the teacher at the classroom level. In the latter schools and classrooms, there is a relatively strong emphasis on uniformity in norms and practices, and an emphasis on discipline imposed from external sources rather than from the content of instruction.

Footnotes to Chapter 7

[1]Tolstoy (Cleveland, Ohio: World Publishing Company, 1946, p. 283-4).

[2]See Bloom (1976, p. 146).

[3]Friedman and Kuznetz (1945).

[4]Corazzine (1968).

[5]Lindman (1970).

[6]Rossmiller et al. (1970).

[7]See, for example, Friedman (1962).

[8]For a further discussion of the social benefits of schooling, see Weisbrod (1964). Unsubstantiated claims of the existence of "social benefits" have, on occasion, been used to justify various kinds of educational programs.

[9]Berliner (1980, p. 193).

[10]See Thomas (1977, p. 93).

[11]Our formula for average learning group size was

$$S = \frac{\sum_{i=1}^{i=n} t_i S_i}{T}$$

Where S = average learning group size

S_i = (i=1 to i=n) is the number of students who comprised the i^{th} segment

t_i = length in minutes of the "i"th segment

T = total observed time

[12]See Wimpelberg (1981).

[13]See Campbell and Layton (1969, pp. 4-6).

Footnotes to Chapter 7, cont.

[14]Our colleague, Susan Stodolsky, has made a comprehensive comparison between instructional methods in mathematics and social studies.

[15]For discussions of the implied outcomes of schooling, see Dreeben (1968) and Bloom (1976, pp. 141-144).

[16]Ferguson (1983).

[17]Lortie (1983).

Chapter 8

SCHOOLS, PARENTS, AND STUDENTS

This Chapter summarizes our discussions about the use of resources to promote learning in homes and schools. It emphasizes the relevance for resource allocation of the disparities between the goals of individuals and of those who are formally responsible for the provision of schooling. It also examines how individuals and organizations may use incentives to affect each other's use of time and other resources. It concludes with some speculations about the relevance of the Report for educational policies.

(1) The Goals of Education

Studying resource allocation in education requires examining the decisions made in homes and schools about the use of time and purchased resources. Inevitably, viewing education in this broad context raises serious conceptual and methodological problems, since educational goals are selected at two separate but interacting levels of analysis. At one level, political leaders and educators are concerned with establishing and maintaining systems of schooling that produce benefits desired by society as a whole. At the other level, parents and students, motivated by perceptions of their own self interest, make choices which affect the success of individual children, both in school and in adult life.

The social benefits of schooling are more than the sum of individual benefits, since social benefits affect not only students and educators, but other members of society as a whole. These third person effects include economic growth, political awareness, social cohesion, and a respect for the rule of law. They constitute a major reason for the involvement of governments in financing and operating systems of public schooling.

However, systems of schooling intended to benefit the entire society may bring unequal benefits to individual students.

While variations in students' learning, within and among schools, may result in part from differences in the school resources available to each child, they also stem from the priorities of parents and students, who are motivated by their perceptions of the private benefits of schooling. These private benefits cause parents to allocate time and money for their children's education, both before and after the latter enroll in school, and also encourage children to devote time to educational activities.

Homes and schools interact with each other, and may be thought of as subsidizing each other's efforts. For example, when parents use their time and money to develop their children's capabilities, the cost to schools of ensuring that students acquire basic learning skills is reduced. School systems may then raise their required standards of performance, and may broaden their curriculum by including cultural and aesthetic subjects as well as subjects requiring the mastery of skills and the accumulation of knowledge. Similarly, when schools are successful in helping children develop the aptitudes necessary for further learning, the cost to parents of preparing their children for the challenges of adult life is reduced. Parents may then raise their expectations for the amount and quality of schooling their children will obtain.

Children may, in effect, subsidize the efforts of their parents and teachers. When children voluntarily devote time to their learning, the tasks of their parents and teachers become easier; both may raise their expectations, and the school system these children attend may find the recruitment of able personnel to be easier and even less costly.

(2) The Content of Education

Some interactions among educators, parents, and students have to do with the content of children's learning, at home and in school. In their attempts to implement the values of society, educators develop curricula that specify the subjects to be taught, the topics to be included in each subject, and the distribution of time across curricular areas. Parents are motivated by their values and their perceptions of the private benefits of education in deciding what to teach at home and what influences to bring to bear on their children's teachers.

While the most publicized conflicts over the curriculum are those among polemicists who espouse various ideological emphases, the really important disagreements are among parents and between parents and their children's teachers. As our research shows, families differ considerably in the manner in which they allocate time and purchased resources for their children's education. Since these decisions affect children's ability to profit from formal schooling, they are a major source of inequality in children's academic achievement.

Curricular content is especially salient in times of social and technological change. During these periods, curricular reform takes place more readily in homes than in school systems, where consensus building is a slow and arduous process. For example, many children first learn to use computers in their homes, where they are taught by parents who use modern technologies in their place of work. Introducing computers into classrooms may be resisted by some educators and by those parents who retain traditional views about schooling.

Within classrooms, teachers sometimes adapt the curriculum to differences in students' interests and aptitudes. These adaptations may include teaching the same subject to different groups of students at different levels

of cognitive complexity. Thus, some fifth grade teachers helped children to understand difficult economic and anthropological concepts, while other teachers confined their instruction to low level cognitive tasks, including requiring students to memorize facts, read from textual passages, and respond in writing to printed factual questions.

Even when the school curriculum is uniform across classrooms, children's home curricula may vary widely. Families' social status and access to resources affect children's home learning; many high SES families are financially able to enroll their children in private lessons or in youth organizations and to provide them with materials for recreational reading. High SES children also spend little time, on average, watching television while many low SES children devote much time to television and very little time to reading and private lessons.

Well-to-do families who can afford a variety of educational experiences for their children's out-of-school hours often send their children to well-financed schools that provide a variety of curricular offerings. Many disadvantaged families, on the other hand, can afford only a limited variety of academic activities in their homes, and must often send their children to poorly financed schools which offer a limited curriculum. Equalizing children's educational experiences requires compensating for differences in their educational experiences at home as well as among and within the schools they attend.

Efforts to improve children's curricula may include: (a) challenging high ability students by providing them with advanced courses and cognitively complex tasks, and by setting high performance standards for them; (b) providing intensive instruction in basic skill subjects for the "less able" students so

that they may invest their time profitably in additional learning at home and at school; and (c) providing curricular options to encourage disadvantaged children to devote time to learning at home and at school. These options may be provided in "alternative" schools or in alternative tracks in a given school. These options may also include attempts to increase parental involvement in their children's schcols.

This brief discussion of home-school interactions with respect to children's curricula is only one example of how homes and schools interact with each other. The next sub-section provides a more extensive discussion of home-school relationships in educational systems.

(3) Interactive Relationships in Public Education

In the last two decades, many researchers have sought to discover the characteristics of schools that affect children's learning, but have ignored the processes by which parents and children affect school systems. Yet, most relationships in public education are interactive; schools affect children, while both children and parents have an important effect on how schools operate. Understanding these reciprocal effects is an essential precondition for improving public education.

One source of difficulty in studying home-school relationships arises from the fact that these two institutions represent different levels of analysis. School and classrooms are intended to affect the learning of aggregates of students, while the decisions of parents and children are intended to benefit individuals. Consider, for example, the relationship between teachers' characteristics and students' performance. Teachers are responsible for using classroom resources to improve the achievement of all students in a classroom. However, since the rate at which children learn is affected by variables specific to each individual, students benefit unequally from a

common set of resources and services. If we wish to predict the achievement gains of individual students, we must isolate the flows of school and home resources to each child, as well as the capabilities that child has accumulated as a result of prior investments.

Complicating this problem is the fact that teachers are seldom assigned randomly to classrooms. Whether teacher assignments are made by school principals or by committees of teachers, the assignment of teachers to specific classrooms is intended to match teachers' characteristics with students' educational needs. Hence, while teachers' characteristics may be assumed to affect students' achievement, students' characteristics affect the assignment of specific teachers to specific classrooms.

In the remainder of this section, we examine relationships among variables specified at three levels of analysis--the school district, the classroom, and the individual student.

(a) The school district level of analysis. The school district is a favorite level of analysis for many researchers and students of public policy because of the existence of unambiguous district level variables, including (i) expenditures per pupil; (ii) census data such as median family income or average years of schooling completed, aggregated to the school district level; and (iii) mechanisms of public choice, such as school board elections and tax referenda whereby individual preferences may be translated into political outcomes such as tax rates and educational programs.

In most of the country, state grants-in-aid only partially equalize expenditures among school districts; variations in expenditure levels are therefore structurally dependent on local property values and tax rates. If public choice mechanisms are efficient, tax rates reflect taxpayers' preferences for public services. James therefore concluded that school district expenditure from local revenue sources depend on district wealth, aspiration

levels, and the existence of appropriate mechanisms whereby parents' preferences are transformed into political outcomes.[1]

It is easier to show how family preferences affect school district decisions than to demonstrate the effect of expenditure levels on learning outcomes at the individual level. To be sure, expenditure levels constitute constraints and opportunities that determine the range of possible choices available in classrooms to students and teachers. More importantly, since teachers' salaries constitute a major portion of school district budgets, expenditure levels set limits on the salaries that may be paid, and hence influence the incentive systems whereby school districts attract and retain well qualified teachers.

Pursuing the home-school interaction further, many high status families are able to send their children to well-financed schools in which salaries and other inducements are relatively attractive and in whoch classrooms are well supplied with books and other resources. Similarly, many low status families must send their children to poorly financed schools where salaries are below average and where classroom resources are in short supply. For the most part, then, students with ample educational resources at home attend schools where resources are plentiful, while many children from disadvantaged homes also attend disadvantaged schools.

However, making inferences about the opportunities available to individual students on the basis of community averages is always a risky business. Many relatively poor families live in well to do communities, while high SES families often live in poorly financed districts. Furthermore, some poor families make extraordinary sacrifices to obtain a good education for their children while some high SES families assign a relatively low priority to their children's education. Also, the economic diversity which exists within large urban school districts complicates attempts to make inferences from district averages to individual families and students. In short, while district level policies may reflect the preferences of the average taxpayer,

the effect of these policies on individual families and students is, at best, uncertain. We therefore turn our attention to an analytic level much closer to the individual student, namely, the level of the classroom.

(b) The classroom level. Classrooms constitute an interesting level of analysis because it is in classrooms that students' time and capabilities that result from prior home and school investments are combined with the purchased resources that result from administrative decisions. The nature of these combinations constitutes the technology of classroom instruction, and, as a result of this process, stocks of classroom resources are transformed into resource flows to individual students.

One important category of classroom variables consists of the human and material resources that are available for use in a specific classroom. A second category of classroom level variable consists of the characteristics of students assigned to a classroom. While students' characteristics are often expressed by such statistical measures as the mean, variance, skewness, and number of atypical children in a classroom, statistical measures fail to do justice to differences among individual students in their capabilities and out of school environments. Another classroom variable consists of measures of parental influence on teachers' decisions. Since our research indicates that the frequency with which parents attempt to influence teachers is a function of parental SES, we use average SES as a proxy for the total time teachers spend interacting with parents with respect to the latter's children.

Since learning is an individual level phenomenon, summary statistics of students' achievement including the variance as well as the mean are not classroom level variables. Instead, the relevant output variable consists of teachers' decisions with respect to organizing the classroom

for instructional purposes. In our sample of classrooms, there was a clear break between the classrooms in which the students were and were not divided into groups for instructional purposes. We therefore used instructional differentation as our classroom level output variable. As anticipated, classroom differentiation is associated with the presence of resources--resources do not cause teachers to behave in a certain way, but the shortages of resources limits the degree to which teachers can adapt instructional procedures to differences in students' ability. Ability variations in the classroom were associated with differentiation but at a non-signficant level.

Our classroom level findings therefore showed relationships which are analogous to those found at the school district level. Families affect classroom practice indirectly through their unequal investments in their children's capabilities and directly, through the time they spend attempting to influence teachers to improve instruction provided to specific students. Teachers, on the other hand, if provided with adequate supplies of resources, tend to provide grouped or individualized instruction in classrooms where parental influences are strong.

Individual students respond unequally to the instructional processes of classrooms. In order to identify the predictors of individual behavior, we turn to the individual level of analysis.

(c) <u>The individual level of analysis</u>. The most important phenomenon in studies of resource allocation in education is that, because individual students have different capabilities and interests at a given point in time, and are still influenced by their out of school environments, they react differently to what is ostensibly a common set of school variables. To correctly specify the influences of schooling on children's learning, it is therefore necessary to identify the input and output variables at the level of the individual student

A central dilemma in such studies is whether to regard students' developed capabilities as an end product or as an input in their further learning. The usual practice has been to identify efficacious school characteristics by measuring their effects on student achievement. Achievement, however, is the result of many influences, past and present. Furthermore, learning is not merely the piling up of skills and facts; true learning includes the synthesis of new learning with what an individual already knows so that, except in specific experiments, it is difficult to actually determine what a person learns in a given month or year.

Because of these and other problems discussed throughout the report, we have regarded students measured achievement as an indicators of the capabilities they invest in their own education. The other input variables are the human and material resources that are made available to them in their homes and schools.

Measuring student specific resource flows in classrooms provides many difficulties, which are discussed in our Chapter 6. Our other major problem is to separate the effect on children's behavior of (a) being assigned to a specific class and (b) being subject to student-specific influences at home and at school. Clearly, this separation must be made if we are to examine individual level relationships. Our resolution, as indicated in Chapter 6 and elsewhere in the Report, is to use, in individual level analyses, the deviations of each variable from the classroom mean. (Table 6-16) We find that students' tendency to supply their time to classroom instruction in mathematics was directly related to their measured ability, to their father's occupational status (for the entire sample and the low SES sub-group, but not the high SES group), to parents' expectations for how far the child will proceed in school, and to the amount of time the student spends at home doing recreational reading. Student involvement is also related to our measure of

class resources provided to each individual student, namely, the average size of the learning groups in which that child spent his time. The analysis for social studies classes was a little less consistent, for reasons discussed in Chapter 6.

In summary, analyses at the individual level show that children's investments of their own time in educational activities are influenced by their ability and by the resources provided for them at home and school. Interested parents and capable students may affect the behavior of teachers, causing them to give attention to the needs of individual students. In return, teachers who individualize instruction can focus their demands on parents and students by indicating to each what skills need reinforcing and what special talents should be fostered.

(4) Incentives in Public Education

When federal, state, and local governments provide money for the attainment of the social benefits of schooling, they have little influence over how their plans are implemented. The important day-to-day decisions that affect learning are made by individual parents, teachers, and students, each of whom is influenced by his or her own values and preferences as well as by the effect of peers and superordinates. Using organizational resources to influence individual decision makers constitutes a potentially powerful method of intervention that may affect equity and efficiency in educational organizations. Since parents and students may use incentives to influence educators, the exchange of incentives is one form of interaction in education.

Incentive systems often involve producing influences across organizational lines; for example, states may influence salary policies so as to induce promising young students to enter teaching. While the effect of organizational decisions on individuals remains problematic, such incentives

may have a sufficient influence on individuals' decisions to produce a marginal improvement in the quality of new teachers. However, many variables besides salaries affect decisions, so studies into the effects of such incentives should be conducted.

(a) State incentives to local school districts. In many states, fiscal distributional procedures incorporate incentives designed either to encourage districts to increase their expenditure levels or to alter their priorities to favor state-approved policies. In both cases, matching grants constitute effective incentives, since each additional dollar a district spends results in its receiving additional funds from the state.

More specific attempts by states to affect district policies have sometimes had adverse consequences. For example, basing grants-in-aid on districts' attendance rates has sometimes resulted in falsifying attendance records, while accountability programs may at times result in "teaching for the test." A more desirable form of incentive to increase both students' attendance rates and achievement levels may be to use state funds to influence the characteristics and behavior of teachers.

(b) Incentives to improve teaching. Recent studies showing a decline in the quality of college students who plan to enter teaching suggest that present incentives for potential teachers are inadequate. Education has special problems in attracting and retaining mathematics and science majors, who often have attractive alternatives in business and industry. One desirable form of public policy is, therefore, to use incentives to attract and retain well qualified and highly motivated teachers. Another desirable policy is the use of incentives to improve the performance of teachers already employed. While both uses of incentives warrant considerable study, the following treatment is, of necessity, limited.

Although salary levels are only one aspect of the total monetary and non-monetary rewards a teacher may expect to receive, other rewards, including improved physical environments and ample teaching supplies also require monetary expenditures. Also, college students who contemplate their career choices may be expected to examine their life time salary streams and not merely their beginning salaries. Clearly, teaching does not offer the most able students with the rewards available to leaders in such fields as medicine, law, business, and accounting. Also, because of the relatively flat organizational structure of school system, and the undifferentiated nature of the teacher's role, there are few opportunities for superior teachers to be rewarded by higher status and remuneration.

While across the board increases in teachers' salaries may be necessary to permit teaching to keep pace with other occupations, they will do little to upgrade the quality of new entrants to the profession, or the performance of presently employed teachers. Neither will higher salaries for experienced teachers encourage improved performance for all teachers. Differentiation of the teachers' role, accompanied by substantially higher salaries for those with superior performance and qualifications offers one way to making teaching a desirable long term profession. Examples of the type of activity which might be rewarded in a performance based salary schedule might be (a) superior classroom performance, as recognized by committees of teachers; (b) leadership in the improvement of instruction, in extra-curricular activities, or in the enhancement of home-school relationships; (c) scarce skills in the use of computers for instructional purposes; and (d) majors in disciplines such as science and mathematics, where teacher shortages are the greatest.

An added impetus for the acceptance of the need for salary differentiation based on competence, qualifications, and leadership may result from the gradual disappearance of the traditional self-contained classroom, on which the rationale for a single salary schedule exists. We found evidence of the

decline of the self-contained classroom in the use of extra-classroom specialists such as teachers of special subjects, Title I teachers, and teachers of gifted children, as well as in the centralized placement of school libraries (or media centers) and mathematics laboratories. When computers become commonplace in public schools, they may also be located centrally, to permit the efficient deployment of specialized personnel. Providing instruction in mini-learning centers instead of in self-contained classrooms may accelerate the differentiation of the roles of elementary school teachers.

A final source of incentives for teachers, not always welcomed, will be the use of resources to enhance home-school interactions. Many middle class families already interact frequently with their children's teachers and exercise an influence on teachers and administrators. Using school based resources to provide information about education to working class parents, and increasing presently available opportunities for parents and teachers to interact with each other may affect the behavior of both teachers and parents. As parents increase their involvement in their children's schools, discipline problems may ease, and children's performance improve as a result of the additional time and other resources parents provide to education. Both parents and teachers may obtain information about the strengths and weaknesses of individual students, so that schools for working class students may increasingly differentiate their instructional procedures, and parental investments may be more effective.

(c) The exchange of incentives between schools and homes. Because schools and homes jointly influence students' progress, the heart of an incentive system in education is the manner in which schools and homes affect each other's behavior. For many years, educators ignored (or even discouraged) parents' attempts to influence their children's schools. Now, many teachers

and administrators recognize the importance of children's home education and of parental involvement in the activities of their children's schools. However, finding effective ways of enhancing home-school cooperation is difficult, especially in poor communities.

Our research suggests that the success of homes and schools in helping children to learn affects the resource allocation patterns of parents, teachers, and students. When parents prepare their pre-school children for the challenges of formal schooling, children progress more rapidly and may even demand special resources from their teachers. Likewise, when schools deal with well prepared students and highly involved parents, teachers are likely to adapt instructional procedures to the special needs and capabilities of individual students. Finally, when children are well prepared at home and in school and consequently gain proficiency in the basic skills, they are likely to invest their own time both at home and in school in academic activities.

(d) School systems' incentives for students. Efforts to use incentives to encourage students to learn have not been very successful, because the incentives which have been chosen are extrinsic to the educational task. We assume that children are, by nature, motivated to learn, and that using money and other pecuniary rewards to encourage them to study are irrelevant and would be perceived by students as nonsensical. We propose three approaches to using incentives to induce students to participate more fully in their learning.

The first source of incentives for students is located in their homes, where parents influence children's attitude toward schooling and toward the use of time. Hence, attempts to involve parents in their children's education may, indirectly affect students' attitudes. This possibility is supported by our finding that students' tendency to be on task in the classroom is related to their social status. Children of higher status parents, who them-

selves possess a relatively high level of education tend to spend more time at home on school related activities, to spend less time watching television, and to be on task in the classroom. Involving low status families in their children's schooling, helping these parents develop the skills and values they need to affect their children's learning, and providing these parents with access to and influence over their children's schooling may improve children's willingness to supply time to learning.

A second form of incentive for students to increase their time investments in learning is for homes and schools to redouble their efforts to ensure that all students master the basic skills--of arithmetic, and, more particularly, of reading. When children learn to read, the resources of homes, schools, and individual students can be invested more effectively. For example, as their children learn to read, parents can have their children read to them. They can purchase books and other materials from which students may gain information and pleasure while reinforcing their reading ability. Similarly, children may use part of their school day in gaining information from printed sources, thus providing a useful alternative to oral instruction. Children who are good readers and who have access to a variety of printed materials have a worth while alternative to television watching as a source of enjoyment and information.

A third form of incentive to involve students in educational activities should be directed toward teachers and other educators. One dimension of teachers' effectiveness is their ability to involve children in classroom learning. Similarly, specially funded projects should have, as one objective, an increased involvement of parents and students in the learning activities of homes and schools.

The time of parents and students constitutes an important resource that should be available for educational purposes. Yet, many parents are virtually uninvolved in their children's schooling. Many children are

frequently absent from school, skip classes, avoid doing homework, and are not involved in classroom activities. Efforts to improve education that do not result in an increased involvement by parents and students are, by definition, failures even if they succeed in some other respects.

Making schools more efficient and more equitable requires the effort and sometimes the leadership of parents, students, and teachers. However, these efforts are not always volunteered. It is therefore necessary for educational organizations to provide incentives to affect decision makers, in order that schools may be more efficient. Incentives to low status families are especially needed, since these families have the greatest need for improved schooling, but are often uninvolved in the schools' efforts.

(5) Summary

In our attempt to identify ways to make schools more efficient and more equitable, we have examined processes of resource allocation for education in children's homes and schools. Our findings have important implications for how public schools may best be financed and administered.

(a) Financing Education for Equity and Efficiency

The changing social and technological contexts of today's schools place additional demands on systems of public education. While additional funds will be needed to satisfy these demands, improving efficiency and equity requires that resources be used as incentives to influence the behavior of teachers, parents, and students. We will now briefly summarize our previous discussion of how money can best be targeted to ensure that schools play their part in permitting society and its members to adapt to social and technological change.

(i) Incentives are needed to make careers in education more attractive to college students. These incentives include but are not confined to improvements in income streams that educators may anticipate over their lifetime careers. Financial incentives to prospective teachers must take into account the alternative opportunities associated with students' choice of a college major, as well as better opportunities to move from lower to higher salary levels on the basis of the assumption of responsibility and superior classroom performance, as well as experience and academic attainment. In part, this change will merely recognize the increased differentiation which already characterizes elementary school teaching.

(ii) Incentives are needed to encourage parents to increase their level of involvement in their children's education. These incentives may be provided at the macro level by requiring some recipients of public aid

to devote some time at school and at home to their children's educational activities. At the micro level, educational organizations may need to provide additional rewards, including coordinative services, to facilitate teacher parent interactions. The greatest incentives for parents to participate in their children's education should, in any case, be provided to low income parents who, because of their value systems, lack of information about schooling and inadequate resources tend to be relatively uninvolved in their children's education--at home and in school.

(iii) As noted above, improved instruction in the basic skills provides an incentive for children to be involved in their own education, because good readers find additional reading for information or for pleasure to be relatively costless. Concentrating on the development of skills by poor children is an important way to contribute to both efficiency and equity in education.

(iv) Another form of incentives to children is to offer curricular choice so that education will be enjoyable as well as profitable. Such choice would provide talented students with programs in academic areas as well as in the arts, athletics, or emerging technologies. Since many middle class children already have access to such programs at home, providing curricular and instructional alternatives to low status children would contribute to equity in education.

(v) Needless to say, curricular change designed to improve education will include training in computer skills. While computer programming, together with advanced courses in mathematics, science, and foreign language should be available (and even required) for talented students, the preparation of all students for jobs in technically changing industries has important benefits for individuals and society at large.

Our data do not permit us to make recommendations about the source of additional funding for education. However, the important social benefits associated with the curricular emphases suggested above suggest that federal participation in additional funding for programs designed to preserve the nation's scientific and technological leadership would be both required and defensible. In addition, there is a federal responsibility for improving programs that will prepare low SES students for work in a rapidly changing labor force, thus reducing the danger that substantial numbers of people will be unemployable in the late 1980's and 1990's.

(b) Administering Efficient and Equitable Schools

The theory and practice of school administration has been modeled, to a considerable extent, on administration in large business and governmental organizations. Centralized planning, hierarchical control, and the use of social scientific research to evaluate the effects of alternative policies have been emphasized in educational management training in this country and elsewhere.

School systems are, however, inherently different from other large organizations. Students--the raw materials of education--participate in their own learning and make choices about how much time they will devote to their education. Parents and teachers, who provide direct instruction to students are largely independent of decision makers at higher organizational levels. As a result of these peculiarities of school systems, incentives rather than transmitted orders are the main source of organizational influences on individual behavior.

Studying the organization of educational systems therefore demands that considerable attention be devoted to the decisions of those at the lower levels of school systems, namely, students, parents, and teachers.

New developments in organizational studies in education should recognize that influence in educational systems flows in two directions, from students and parents to schools as well as from schools to their "clients."

Appendix A

RESEARCH DESIGN

In the previous chapters, a comprehensive theory for explaining allocatory decisions in educational systems was presented. Our purpose here is to describe the design of the research. First, the population and sampling procedures will be described and secondly, data collection procedures, including the training and supervision of project staff will be specified.

(1) Sampling Procedures

The population of the study consists of all elementary school districts, elementary schools, and fifth grade classrooms and students in the Chicago SMSA. The sample consists of 20 school districts, 23 schools, 62 classrooms[1] and 253 public school fifth grade students. The fifth grade was chosen: (a) to avoid the controversy surrounding the teaching of reading to younger students; (b) to eliminate the increased variability in the organizational structure of schools which is associated with grades higher than fifth;[2] and (c) to focus on an age group whose members have some autonomy and yet are still involved in developing the skills which are essential for higher levels of learning.

Selection of the School Districts

The 218 elementary school districts in the Chicago Standard Metropolitan Statistical Area were stratified by median family income and per pupil expenditure. The data with respect to family income and school expenditures were obtained from a composite tape which includes information

from the 1970 National Center for Educational Statistics Illinois school district file and the Illinois Office of Education school finance file for the 1972-1973 and the 1976-1977 school years. On the basis of this stratification process, twenty elementary school districts were randomly selected[3] over a three year period. Although every effort had been made to avoid this problem, information obtained directly from the districts and schools during the course of the study indicated that the socioeconomic characteristics of the attendance area of several schools differed from the 1970 census characteristics of the district as a whole. These schools, and for convenience, their districts, were then reassigned to their proper position in the sample relative to median income and per pupil expenditure. The stratified samples for the first and second and third years of data collection are shown in Tables A-1 and A-2.[4]

Selection of Schools and Classrooms

Meetings were held with district superintendents for the purpose of identifying schools within the district whose attendance area typified the socioeconomic characteristics of the district.[5] Once a school was selected, the principal was asked to identify fifth grade mathematics and social studies teachers who might be willing to participate in the research. Separate meetings were then held with the teachers in order to solicit their support and access to their classrooms. Mathematics and social studies were chosen on the premise that while the primary goal of math instruction is the inculcation of basic skills, social studies is oriented to the application of a mix of reading, writing, and information processing skills. The inclusion of two quite different curricular areas made it possible to compare student preferences on the basis of both subject matter and technologies. In two

cases, one in each of the first two years of data collection, it was necessary to substitute another subject for social studies. The subjects chosen were language arts and science, respectively. Finally, in two schools, a supplementary math lab was required for low achievers and the decision was made to add these classes to the sample in the hope of approximating more closely the total flow of resources to project students in that subject area.

Selection of Project Students

After the classrooms were selected, permission slips were sent to the parents of all the children in each class. Parents were asked: a) to allow their child to be observed in one or more classes; b) to permit access to their child's scores on a standardized achievement test which would be administered as part of the project, and to his/her attendance records; and c) to agree to be interviewed.

A sample of eight students was selected from the pool of students in each class whose parents had granted their permission. During the first project year, teachers were asked to divide the pool of eligible students into three ability groups. Three students were then randomly selected from the high and low groups, while two were drawn from the middle or average group. Efforts were also made to balance the sample with regard to sex. This presorting on the basis of the teacher's perception of students' ability was abandoned in the second and third years of data collection in favor of random selection.

The students selected were observed, where possible,[6] in two classes for a two week period in the first year and a three week period in the second year of data collection.

(2) Data Collection Procedures

Once the districts, schools, classrooms, and students were selected, data were collected at five levels -- the district level, the school level, the classroom level, the classroom activity or segment level, and the individual student level.

District Level Data

A thirteen item questionnaire was sent to the Superintendent of each participating school district and at the same time financial statements and salary schedules were requested. The questionnaire was designed to standardize the reporting of certain district financial and teacher data, which tend to be computed differently in accordance with the budget format each district elects to use.

School Level Data

The principals were also asked to complete a questionnaire related to both the human and material resources available in their building. In addition, they were requested to supply the attendance records of the project students.

Classroom Level Data

Classroom data, including the number of teachers and teacher aides assigned to the class, the occupational and educational histories of the teachers and aides, the size and shape of the classroom, and the number and kinds of instructional materials available for use were gathered by the observers. The principal or teacher also supplied a list of the occupations of the head of household of all the students in the classroom. While only a rough estimate of the available material resources was made

in the first year, in the second and third years a detailed inventory was taken. The observers also obtained information relating to whether or not the class represented an ability track (and, if so, which track) and whether the class was self-contained or departmentalized. In addition, mathematics and reading subtests of a standardized test were administered to all the students in each classroom in the sample and the teachers were interviewed. The teacher interview focused on questions related to the physical arrangement of the classroom, the adequacy of classroom space, treatment of individual differences among students, perceived level of control over curricular decisions, subject area preferences, job satisfaction and expectations for the levels of schooling the students would complete. Teacher interviews were only carried out in the second and third years of data collection.

Activity Level and Student Level Data

The individuals responsible for observing and interviewing were trained in a two to three week period, two weeks in the first year and three weeks in the second and third years immediately preceeding the collection of data. The principals of two elementary schools in the vicinity of the University of Chicago permitted the trainees to observe in their fifth grade classrooms. The classrooms in these two schools were particularly well suited for training as they provided the opportunity for the trainees to observe and record a wide variety of instructional technologies. After each observation session, the observers met with one of the project directors or one of the coordinators to resolve difficulties about the use of the instruments and the student behavior codes. Comparisons were also made of the records of the observers who were in the class at the same time in order to ensure reliability among observers.

The trainees, in each year, were also familiarized with a detailed set of specifications which explained the purpose of each item in the parent interview, as well as the type of probes which had proved effective when the interview was pre-tested. In addition each trainee conducted at least one practice interview with a parent of a child not in the project. Several large and small group sessions were held to discuss the techniques of interviewing as well as the difficulties anticipated in the responses to particular items.

In the first year of data collection, one observer was assigned to each classroom, while in the second and third years two observers were assigned to each class. Thus in the first year a single observer was responsible for recording both the characteristics of the instructional technology(s) in use and the project students' behavior. The protocol for that year required that the observer first record the characteristics of the instructional technologies namely, the content, duration, location, number of students, the use of teacher and student time, and materials. After this was completed, the observer began a sweep of the project students noting their behavior during a ten second interval every two minutes. The student was coded "on an academic learning task" if during the specified interval he or she appeared to be actively engaged in an activity prescribed or permitted by the teacher. He or she was coded "off task" if waiting, socializing, or daydreaming. A special code was used if the student was engaged in academic work which the teacher would not have permitted had he or she known about it -- for instance, reading a novel during a math lesson. In addition, both on and off categories were broken down into subcategories with related codes indicating the precise nature of the student's behavior. In an instance where the observer was not sure whether the

student was "on" or "off task", a question mark was used and the behavior was described.

The observation instrument was designed so that in the case of simultaneous technologies or activities each student's behavior could be linked to the appropriate activity or segment of class time. Descriptions were, however, provided for every technology in use regardless of whether or not there were any project student participants.

Dissatisfaction with the level of detail a single observer could record and the loss of student observations while the observer was describing the activities led to the assignment of two observers to each class in the second and third years of data collection. The two observers synchronized the beginning of their records then one focused entirely on describing instructional activities while the other observer systematically recorded each project student's behavior during a thirty second interval every four or five minutes. The protocol required that one minute be allowed to elapse after every third sweep of the project students in order to reduce observer fatigue. That the division of labor led to the collection of much richer data than were obtained in the first year of data collection may be seen by a comparison of the instruments used in each year. Not only were more characteristics of each activity noted in the second and third years, but all student behaviors were verbally described as well as assigned codes. The use of two observers and their required consultation before submitting their records also resulted in the reduction of ambiguity and, we believe, in greater accuracy.

In both years the observers also conducted most of the parent interviews.[7] The purpose of the interview was to elicit information related to

the stock of purchased resources in the home, the way in which parents elected to spend time with the project student, and the way in which the project student spent his time after school. The second year interview was similar to the first; few items were eliminated, while a number of items related to parental choice of household location and preferences for curricula were added. The interview is duplicated in its entirety in Appendix B, with those questions asked only in the second year indicated by an asterisk.

(3) Summary

Over a two year period, data were gathered at the district, school, classroom, individual activity, and individual student levels for a total of 20 districts, 23 schools, 62 classrooms and 253 fifth grade public school children. The districts were chosen by a stratified random process which was based on three socioeconomic levels and two per pupil expenditure levels. Within each district, an attempt was made to select a school and classrooms whose socioeconomic characteristics reflected those of the district as a whole. Up to eight students were chosen in each class from the pool of children whose parents had signed consent slips; the parents of these children were interviewed in the home.

Classroom observations were carried out by trained observers who spent two or three weeks in each classroom, one observer to a classroom in the first year and two in the second and third year. Fifth grade classes were selected throughout; mathematics and social studies were the subjects chosen for observation. Instruments were developed to record the characteristics of each instructional technology and the students' behavior in

response to those characteristics. Information related to the human and material resources for the promotion of learning in the home and the manner in which students spend their out-of-school time was obtained by parental interviews.

Table A-1

FIRST YEAR SAMPLE

		Median Family Income		
		Low ($12,000 or lower)	Middle ($12,000 - $15,000)	High ($15,000 or higher)
Per Pupil Expenditure		Cell 1	Cell 2	Cell 3
	Low ($1,083 and lower)	Districts = 1 Schools = 1 Classes = 2	Districts = 2 Schools = 2 Classes = 4	Districts = 0 Schools = 0 Classes = 0
		Cell 4	Cell 5	Cell 6
	High ($1,229 and higher)	Districts = 3 Schools = 3 Classes = 6	Districts = 3 Schools = 3 Classes = 6	Districts = 1 Schools = 1 Classes = 3

Table A-2

SECOND YEAR SAMPLE

		Median Family Income		
		Low ($12,000 or lower)	Middle ($12,000 - $15,000)	High ($15,000 or higher)
Per Pupil Expenditure		Cell 1	Cell 2	Cell 3
	Low ($1,271 and lower)	Districts = 2 Schools = 2 Classes = 7	Districts = 2 Schools = 2 Classes = 8	Districts = 0 Schools = 0 Classes = 0
		Cell 4	Cell 5	Cell 6
	High ($1,441 and higher)	Districts = 2 Schools = 2 Classes = 6	Districts = 2 Schools = 3 Classes = 8	Districts = 2 Schools = 3 Classes = 8

Footnotes to Appendix A

[1]For reasons of clarity, classrooms are counted by subject identification rather than teacher affiliation. Thus, a student observed in both math and social studies is considered a member of two classes whether or not his fifth grade is self-contained or departmentalized.

[2]Sixth, seventh, and eighth grade students may be in K-8 schools, middle schools, or junior high schools.

[3]For a variety of reasons a number of districts refused to participate in the study. When a district refused to participate, a substitute district with similar characteristics was identified. In all but two cases, the substitute districts were obtained randomly.

[4]Second and third year samples are shown together as only one school was added in the third year and identical data collection procedures were used.

[5]In one case, two schools were chosen. And in another district, three schools were chosen.

[6]Scheduling problems in departmentalized schools made it impossible to observe all project students in two classrooms. As a result some students were observed only in one class.

[7]Efforts were made to match the race and sex of the interviewer with that of the parent being interviewed.

Appendix B

PARENT INTERVIEW

DATE_____ CASE NUMBER_____

Name of Interviewer_____ _____
(last) (first)

Name of Respondent_____
(last) (first)

Address_____
(street) (city) (zip)

Phone Number_____ _____
(area code) (number)

Name of Project Student_____
(last) (first)

Relationship of Respondent to Project Student_____

(Question asked only in the second year of data collection are marked by an asterisk)

1.

1. What are the names, ages, and grade levels of your children? (List them in the following table, beginning with the oldest.)

name	sex	age	present grade level or highest level completed	living at home (yes or no)

2. Are there any adults besides yourself living here? (Remember to check the parent you are interviewing. Do not put adult children in the "other" category. They should be listed in 1.)

mother_____

father_____

other_____
(specify)

2.

3. Now I'd like to ask you about the ways H_____ spends her/his time outside of school, during the school year.

(Note: student's time should include only active involvement; parents' time should include chauffering, getting materials or equipment for the activity or any other facilitating activities, as well as participation.)

	name of activity	amt. of student's time in a typical wk. in the school yr.	amt. of time per wk. provided by mother	father
hobbies				
sports (does not include watching)		fall winter spring		
youth organizations				
television watching				

3.

4. How much time does S_____ spend reading for recreation in a typical week?

	BOOKS	OTHER (Include magazines and comics)
Amount of time spent in a typical week during the school year.		
Amount of time spent in a typical week during the summer.		

5. (A) Estimate the number of books S_____ will read during the current school year.

(B) Estimate the number of books S_____ read during last summer.

4.

6. Does M_____ take any lessons outside of school, e.g., tutoring, music lessons, dance lessons, religious instruction, etc.?

(Note: for student's time include only time for practice and the lesson itself; for parent's time include chauffering, assisting or any other type of facilitating activities.)

type of lesson	period of study	amt. of student's time per wk. (include time for practice and lesson only)	amt. of time provided by mother	father

summer school last year?

yes_____ no_____

(If "yes") What subjects?

_____

_____

_____

5.

7.(A) How many times a week does R_____do homework after school?

(B) When R_____does homework, about how much time does he/she spend?

(C) Based on what you've said, it sounds like R_____spends _____
(7(A) times 7(B))
(amount of time) doing homework in a typical week. Is this correct?

6.

8. (A) Of the _____ hours H_____ spends doing homework, how much of the
(answer to 7C)

time is spent doing each homework?

(B) Of the _____ hours H_____ spends doing homework, how much
(answer to 7C)

time is spent doing (second subject) _____ homework?

9. Here is a list of the types of homework teachers might assign.
(Give respondent hand-out.)

(A) What types of homework are most often assigned in H_____'s math
class? (Check as many as appropriate.)

(B) What types of homework are most often assigned in H_____'s
_____ class? (Check as many as appropriate.)
(second subject)

	math	second subject_____
Specific pages in texts and workbooks.	( )	( )
Work not finished in school.	( )	( )
Special projects.	( )	( )
None.	( )	( )

Other (please specify).

7.

10. Where does M_____usually do his/her homework?

11. Is there a regular time when M_____studies at home?

yes____ no____

How many times a week does M_____follow this schedule?

12. (A)How often does M_____do his schoolwork while watching television?

a)always____b)usually____c)sometimes____d)never____

(B)How often does M_____do schoolwork while listening to the radio or stereo?

a)always____b)usually____c)sometimes____d)never____

8.

13. Do you or your husband spend any time helping R_____with his/her homework or does R_____do it on his/her own?

(If the parents help)

In a typical work week, how much time do you spend working with R_____ on school work?

(Probe for specific kinds of help as well as for the amount of help.)

(Enter information in chart on next page.)

8.(A)

(13) Parent time.

source of help	subject	amnt. of time per week	kind of help given
MOTHER	MATH		
	SECOND SUBJECT_____		
	OTHER (specify)		
FATHER	MATH		
	SECOND SUBJECT_____		
	OTHER (specify)		
SIBLINGS			
OTHER (specify)			

2.

14. (A) About how many books and magazines of the following types do you have in your home?

	estimated number
BOOKS:	
Adult	
Children	
MAGAZINES:	
Adult	
Children	
COMICS:	
REFERENCE MATERIALS:	
Encyclopedia (sets)	
Dictionary	
Atlas or maps	
Others(specify)	

(B) About how much do you spend a year on books and magazines in a year?

Books_____

Magazines_____

10.

15. Please estimate your expenses for X_____'s on-going learning activities?

type of activity	total out of pocket expenses (specify unit of time)	capital expenses (specify yr. of expenditure as well as amount)
hobbies		
sports		
youth organizations		
music lessons		
other lessons		
tutoring		
summer camp		
other (specify)		

11.

16. How is K_____doing in his/her schoolwork?

*Probe for competence or difficulty in specific subjects.)

12.

17. (A) Do you think H_____will complete

High School	yes___	no___
Two years of College	yes___	no___
Four years of College	yes___	no___
Graduate School	yes___	no___

(B) (If not addressed in response to 17 (A))

Is this any different from how much schooling you hope H_____ will complete?

18. How far do you think your other children will go in school?

child	level of schooling

13.

19. The elementary school curriculum for the 5th grade usually includes subjects like language arts (reading, writing, spelling), mathematics, social studies, and science. Some schools add other subjects.

(Give respondent hand-out.)

(A) Here's a list of subjects. Should any of these be included in H_____'s program in the 5th grade:

(i.e., should any be included whether or not they already are?)

RECORD CHOICES ON THIS PAGE
(circle respondent's choice for each subject)

vocal music	strong yes!	mild yes	neutral	mild no	strong no!
instrumental music	strong yes!	mild yes	neutral	mild no	strong no!
art	strong yes!	mild yes	neutral	mild no	strong no!
foreign languages	strong yes!	mild yes	neutral	mild no	strong no!

others you might add?

_____	strong yes!	mild yes
_____	strong yes!	mild yes
_____	strong yes!	mild yes

★(Probe for reasons which relate to H. Go subject by subject. Record on next page.

Expectations or probe stimuli for "yes" responses to above subjects:

— H shows interest or ability in subject
— H is at the right age to profit from subject
— H should be exposed to many subjects
— respondent studied subject and would like H to be introduced

Expectations or probe stimuli for "no" responses to above subjects:

— H shows no interest or ability in subject
— H is too young to profit at this time
— H needs to spend time on other subjects
— subject is too expensive to include
— not enough time in school day to include subject

14.

* 19.(A) Reasons for preferences on vocal music, instrumental music, art, foreign language, and others.

Reasons. Relate to N_____

VOCAL MUSIC

INSTRUMENTAL MUSIC

ART

FOREIGN LANGUAGE

OTHERS:

13.

• 13. (B) Does M_____study any of these subjects at school?

(List those subjects from 13 (A) which M has in school.)

(C) Is the instruction in each of these subjects adequate for M_____?

*(Go subject by subject.)

↑ ↑ → REMEMBER ① TIME ② QUALITY

16.

• 19. (D) Are there any subjects in M_____'s curriculum which you think should be eliminated?

★(Probe for reasons for each subject mentioned.)

17.

*20. (A) As we have already noted in the last set of questions, children study a variety of subjects in the 5th grade.

Would you say that some subjects are more important than others or that some subjects should be given more emphasis than others in H_____'s program this year?

*(Probe for subjects and reasons which relate to H.

If respondent needs stimulus, ask:

"Picking a couple subjects for example, are reading and music of equal importance for H or should one be emphasized more than the other?"

If necessary, pair up a couple other examples: math and science, art and social studies, etc.)

Subjects. Reasons. Relate to H_____

18.

* 20. (B) (If applicable.)

You mentioned that (list from 20 A) _____

_____

should be emphasized more than some other subjects.

Is the instruction in each of these subjects adequate for X_____?

★(Go subject by subject.)

↑ ↑ → REMEMBER ①TIME ② QUALITY

19.

21. (A) What topics has S_____ studied in each class this year?

(B) (If applicable) How do you know this?

(Probe for the source of the information, e.g., the child, the teacher, child's homework, PTA, etc.)

22. (A) What topics has S_____ studied in _____
(second subject)

class this year?

(B) (If applicable) How do you know this?

20.

23. (A) Teachers arrange their classes in different ways.

Which of the following arrangements best describe M_____'s math class?

(Give respondent hand-out. Fill in "math" column in table below.)

(B) Which arrangements best describe M_____'s _____ (second subject) class?

(Fill in "second subject" column in table below.)

	Math	second subject
1. The teacher divides the class into groups and instructs one group while the other groups do activities on their own.	( )	( )
2. The teacher uses individualized materials to permit each child to progress at his or her own rate.	( )	( )
3. The teacher works with the entire class. He or she leads discussions, conducts recitations, and drills students in skills.	( )	( )
4. Teacher and students set learning goals, and students participate in decisions about how best to attain them.	( )	( )
Not sure.	( )	( )

(C) How do you know this?

(Probe for source of information.)

21.

23. (D) Do you think any of these types of arrangements should be used more often than others in M_____'s classes?

**(Probe for specific value parent associates with preferred arrangement(s); relate to M as much as possible.)

24. Have you or your husband talked to M_____'s teacher since school started in September?

(If "yes") Fill in table below.

month	husband/ wife	who arranged for meeting	topic(s)	results
			Probe any descriptors used.	(did meeting lead to parents, teacher, or school doing something differently?)

(25) Have you or your husband ever talked to anyone else at school about M_____?

(If "yes") Fill in table below.

person contacted	month	husband/ wife	who arranged for meeting	topic(s)	results
				Probe any descriptors used.	(did meeting lead to parents, teacher, or school doing something differently?

(26) Have you or your husband ever been to a meeting with anyone else in the school or district? (PTA, principal's coffee, school board, school or district committee)

(If "yes") Fill in table below.

person/ organization	month	purpose of meeting	nature of involvement (observer, participant, officer, committee member)
		Probe any descriptors used.	

24.

(27.) Do you ever talk with other parents about the school or school district?

(These meetings exclude PTA and other school organizations mentioned in 26.)
(If answers "yes", fill out table below.)

•How often? •How many parents?	Formal or informal meetings	Topic(s)	Has group met with school people? (wit whom, what results)
		Probe any descriptors used.	

(28.) How long has your family lived in this school district?

25.

* 29. ITEM SORT

"People are often interested in different things when they decide where to live. And different communities satisfy preferences in various ways.

(A) "Imagine that you are going to move soon and you want to find the perfect community for your family to live in. Here is a set of items which may be more or less important in your decision about where you will move."

(Hand respondent set of labels.)

"Look these over and tell me if there are any items you would like to add."

(Make additional labels if necessary. Give respondent final set of labels and the two pages of ITEM SORT ordering sheets.)

"Please place these items on the ordering sheets in an order according to their importance for your family as you make this imaginary move. Put the most important item in space "1", the next most important in space "2", and so on until the item of least importance is at the end of the set."

(Respondent may sketch in numbers on the labels before putting them on the ordering sheets if necessary. If respondent changes mind on some items after the labels are already on the ordering sheets, change the numbers to correspond to the correct ordering. If respondent prefers to group items, place a bracket around numbers to show grouping--make sure the lower the numbers in a group, the more important that group of items. If respondent wants to mark certain items as absolutely unimportant, circle the number in front of the items and write "unimportant" next to them. Make sure all labels with items are put on the ordering sheets.)

- - - - - - - - - - - - - - - -

(B) "Now I'd like you to think about this community where you actually live and how satisfied you are with each of these items. Next to each item you see a row of "x's" which represent a set of choices: 'quite satisfied', 'somewhat satisfied', 'neither satisfied nor dissatisfied', 'somewhat dissatisfied', and 'quite dissatisfied.' Please go item by item and circle the "x" which most closely approximates your level of satisfaction or dissatisfaction with each item."

(Record any discussion during this exercise. For any items evaluated as absolutely unimportant during the ordering sort above [where the number is circled and item is marked "unimportant" in the ordering column] respondent will not circle a satisfaction choice. Make sure a satisfaction choice is made for all other items.)

MAKE SURE RESPONDENT'S NAME OR CASE NUMBER IS ON BOTH ORDERING SHEETS. ATTACH THEM TO INTERVIEW.

26.

* 30. (A) Did the characteristics of this school or district play any part in your decision to move to this community or remain in this community?

*(Probe for as much detail as possible in school or district characteristics mentioned. Label comments as to whether they refer to a move to the community or remaining in the community.)

(e.g., general reputation, class size, curriculum, high school for area)

* (B) Did an older child go to this school before H_____?

Yes____ No_____

* (C) (If "No") Do you remember how you found out about this district and H_____'s school?

Kind of information (list from 30 (A))	source

27.

31. Are you saving money for the future education of your child(ren)?

(If "yes") How long ago did you start saving?

32. What are the highest levels of formal schooling completed by the adults in your household?

Person	Level of schooling (If "nursery" are mentioned, ask, "How many?")

23.

(If you know the mother is working, ask the following set of questions.)

23. (A) Please describe your present job.

(Probe for details regarding the nature of the duties, the level of responsibility, and the level of skill which is required.)

Title of Job	Location	Period of Employment	Duties and responsibilities	Required skills	Amount of Spent Working in Typical W

Have you ever held other jobs?

yes____ no____

(If "yes") Please describe these jobs.

Title of Job(s)	Location	Period of Employment	Duties and Responsibilities	Required Skills	Full or Part time

29.

(If you are unsure of whether or not the mother is working, ask the following set of questions.)

33. (M) Have you ever been employed outside of the home?

yes____ no____

(If "yes") Please describe your recent jobs.

Title of Job(s)	Location	Period of Employment	Duties and Responsibilities	Required Skills	Full or Part time

30.

34. (A) Please describe your husband's present and recent employment.

(Have respondent describe the most recent employment first.)

Title of Job(s)	Location	Period of Employment	Duties and Responsibilities	Required Skills	Amount of time worked in typ. wk

31.

34. (H) (If appropriate)

Please describe the present and recent employment of other adults in the home.

Identity of Adult	Title of Job(s)	Location	Period of Employment	Duties and Responsibilities	Required Skills	Full or Part time

35. Are there any comments you would like to make about this interview?

Or anything else you would like to add?

THANK YOU ! ! !

Appendix C

RESOURCE ALLOCATION WITHIN CLASSROOMS

In Chapter 6, we examined the decisions whereby the money which is obtained by taxation at the state and local levels of government is transformed into purchased resources for classroom use. We also discussed some of the uses of these resources, including (a) constituting direct inputs into instruction, as when a flow of information (from teachers, books, films, and television) is transmitted from the instructional medium to the student; (b) acting as organizers of instruction, by adapting instructional procedures to curricular differences and to differences in students' ability; and (c) constituting a source of incentives to induce students and parents to supply their time and other resources for the former's education.

We now turn to the last phase of the analysis, which consists of tracing resource flows to individual students in classrooms, thus permitting an examination of the degree to which classroom processes serve the goals of equity and efficiency in the use of resources. This last challenge is the most important of all that we have faced, because the important issues of equity in education are those which affect individuals rather than groups. Efficiency in the production of learning is also, in the final analysis, an issue involving individuals, since students differ in their learning productivity, according to their own characteristics and according to the nature of the curriculum.

Perceptive observers of classroom practice have long noted that students benefit unequally from the services of teachers. However, in recent years, this issue has been examined from a different perspective by two economists, who dealt, first, with the conceptual and methodological aspects

of the problem, and, second with the implications for equity and efficiency of variations in resource flows to individual students.

These economists, Byron Brown and Daniel Saks, first went to the root of the problem by examining the implications of group instruction for the allocation of resource flows among students. They pointed to two possible interpretations of such instruction. One interpretation is that, when a teacher lectures to a group of students, each student in the group receives the full benefits of the teachers' services. According to this interpretation, teaching has some of the characteristics of a public good, in which each individual receives the full benefit of the service, and the benefits received from one individual do not subtract from those available to others. In other words, if T represents the cost per minute of a teacher's services, and t_i is the value (per minute) of the services received by the i'th individual, then: $T = t_1 = t_2 = t_i = \ldots$

This is the concept of jointness in production. Its application is most clear in the case of lecturing, in which all students have access to the sound waves created by the teacher, unless those students have a hearing disability. This application is less apparent if lecturing is accompanied by questions and answers, or when the question of the difficulty of the presentation is raised. Consider, for example, the case of the teacher who lectures to a class of three students, who have substantially different capabilities. If the teacher uses a vocabulary which is appropriate to the student who is at the median of the group in his or her ability to understand the presentation, that student may obtain most benefits from the teacher's presentation; the below average student may not understand the lecture and the above average student may be bored by it.

A second way of conceptualizing the flow of services from classroom resources to students is to consider the case where the students each receive a share of the teacher's services, and where the services received by one student subtract from those which are available to other students in the classroom. This interpretation may be best understood by thinking of the teacher who (at her desk or walking among her students) helps students individually. In this case, the flow of resources is characterized by the concept of separability rather than jointness in production. If T represents the cost per minute of a teacher's services and t_i is the value (per minute) of the services received by the i'th individual, then:

$$T = t_1 + t_2 + \ldots + t_i + \ldots$$

In other words, the total value of the teachers' services is equal to the sum of the value of the services received by individual students.

Since jointness in production, and the savings it produces is the major economic justification for instruction in groups (as opposed to one-on-one tutoring), all group instruction is characterized by some level of jointness. On the other hand, individualizing instruction according to the capabilities of the students in a classroom requires that instructional services be thought of as being characterized, in part, by separability in production. If instruction were characterized by pure jointness, the size of the learning group would be immaterial to the effectiveness of instructional services, and it would make economic sense to confine instruction to very large groups to be lectured to rather than taught as individuals. The fact that we do not organize our "better" schools and colleges in this way suggests that pure jointness is a faulty description of how classroom services are delivered.

In short, instruction as practiced in schools and colleges is characterized by a mixture of jointness and separability. Since, from an accounting viewpoint, the cost per pupil of a teacher's services is inversely proportionate to the size of the student group, we have used the concept of separability as the basis of our analysis of resources among students in a classroom.

While jointness and separability in the production of learning are mainly accounting concepts, Brown and Saks deal also with a more fundamental issue, namely the implications for equity and efficiency of the way in which teachers allocate their own time and other resources among students in a classroom. Dealing again with simplified alternatives, teachers have the option of emphasizing efficiency or equity in their resource distribution procedures.

Maximizing efficiency implies using resources in order to maximize the mean achievement levels of the classroom. This objective can best be reached by allocating resources among students so as to equalize the marginal product of investments in the faster and slower students. This implies providing more resources for the more capable learners and fewer resources for the slower learners, whose ability to transform time into learning is relatively low. Brown and Saks used the term "elitists" to describe teachers who use this principle to guide their classroom practice.

Maximizing equity implies, at this simplified level, allocating a disproportionate amount of resources to the slower students, in order, not to maximize average achievement, but to decrease the variance in achievement within the classroom. They called teachers who typify this emphasis "egalitarians." By labelling the teachers who emphasize efficiency or equity as elitists and egalitarians, Brown and Saks create additional conceptual problems.

(a) One of the problems they create is that this emphasis on equality and efficiency is not necessarily a dichotomy. Using resources to increase the skill levels of the "slower" students may result in improving the productivity of these students, thus increasing efficiency as well as equity. In the long run, an educational system which emphasizes skill training may be both egalitarian and elitist since, while the slower students receive additional training, the "faster" students may be provided with "enrichment" exercises.

(b) The interpretations presented by Brown and Saks do not take account of the complexity of the instructional adaptations of teachers to differences in students' ability. For example, teachers may accommodate to these differences by assigning library research to the "better" students while other students are provided with intensive instruction by the teacher. The fact that direct instruction is more expensive than library research is hardly relevant to issues of elitism and egalitarianism, since both the brighter and the slower students are being provided with assignments which match their ability and interest. Furthermore, while the teacher spends less time with the faster students, the time she does spend may be of a highquality, involving, for example, the discussion of complex concepts, while the time spent with the slower students may deal primarily with mechanical tasks like adding fractions. Furthermore, it seems unlikely that, the teacher is motivated by ideological preferences when instruction is differentiated according to students' interests and abilities.

(c) The above example is only one aspect of the curricular differentiation which may be utilized to provide appropriate instruction for students of different ability levels. Another example is assigning a unit in number theory to the brighter students in a classroom, while the slower

students are receiving additional practice in the basic algorithms. It is hard to interpret this type of behavior as implying an elitist or an egalitarian approach on the part of the teacher. Furthermore, this type of adaptation will not have the effect of either maximizing mean test scores or reducing the variance in these scores, since the fast and slow students are pursuing different curricular objectives.

Analysis.

It is apparent from this discussion that we do not view the quantity of purchased resources allocated to students of different ability levels as an indicator of equality in educational opportunities within classrooms. Rather, it seems essential for both equality and efficiency that investments be concentrated on the development of learning skills of low ability students. Beyond that, we would look for evidences of adaptation of the quality and content of instruction to the ability and interests of students who are achieving at the desired level of mastery in skill subjects.

Nevertheless, it seems desirable from an analytic viewpoint to examine the determinants of resource flows within classrooms. For this purpose we have developed a definition of flow which corresponds generally to the separability assumption. According to this assumption, the major determinant of the resources a student receives is the size of the groups in which he or she is provided with instruction. For this purpose, we analyze our data at the level of the instructional "segment" which, as we have already explained, is a discrete learning activity, involving the use of specific resources, for a given period of time. (See Chapter 6)

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